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Every railway president, director or general manager who is not thoroughly up-to-date in his knowledge of apprenticeship systems in railway shops and other educational measures for railway employees should have on his desk a copy of the book on this subject by J. Shirley Eaton, which has just been issued by the government,* and which can be had, presumably, for the asking. Mr. Eaton has gathered everything on railway education that is worth putting into a book, and has arranged the matter in readable and convenient form. He has sound views on the philosophy of education, and so knows what to select; and he has had long experience in the railway service, so that he gives his work the right color. In some places his theories are elaborated too minutely for pleasant reading, and the practical railway officer will revolt—as he would if the president of the Idaho Northern or the New Mexico Central should engage the Broad Street Station at Philadelphia, with its 500 office rooms, as a place in which to carry on the management of his short railway. But Mr. Eaton's theories are sound, if they are a trifle too rich for the common appetite, and in one sense they are the most valuable part of his work, for they are much needed. What we mean is this: The pamphlet contains facts as to what has been done and theories of what ought to be done. The facts are pretty well known, and all that is needed is to bring them to mind with sufficient force and frequency. No one can deny the value of what has been done in, for instance, the mechanical department of the New York Central and of certain other large roads. But the education that is still waiting to be taken up, such as the training of station agents, telegraphers, track repair men, locomotive runners, trainmasters, and others is not sufficiently appreciated, and it is well to have its importance set forth in any way possible. Many railway officers have hardly given it a serious thought. A prophet in the wilderness, like Mr. Eaton, performs, therefore, a very useful function. Being in a wilderness—a wilderness of indifference—he has little to inspire him to go into all the details of his subject, and he has not done so. It would scarcely be profitable if he did, for the first task is to awaken his audience. This the pamphlet is well calculated to do, if the men who have responsibilities in this field will read it. Moreover, Mr. Eaton has not made this compilation for profit, and probably could not afford to give the time necessary to explore his subject as it ought to be explored. But he has brought together some very plain statements, and if these are weighed with the necessary care there is no need that any author should spend further time in philosophizing; the need rather is that railway managers should act.

*United States Bureau of Education, Washington; Bulletin No. 10, 1909

Mr. Eaton's summary of conclusions is given on another page. Here, as in the body of his work, much of his language is rather dogmatic, but we do not blame him. We cannot conceive that broad-minded railway men will deny any of his dicta. Who will say that in the exacting conditions of modern railroading all classes of officers should not be well trained? Who will question the declaration that any scheme of railway education should be continued for a series of years? We cannot see but that all such schemes now established ought to be continued indefinitely. For the past 50 years superintendents, locomotive runners, station agents and others have for the most part trained themselves; for the next 50 these classes ought to have systematic training, which means education by the company. Mr. Eaton's plea for two grades of apprentices, for changing men around, and for more thorough examinations is only another way of saying, what we all know, that in many individual cases more could be made out of a man than usually is made, even by the best railway educational agencies now known. The idea of a superintendent of education for a whole railway system, who should recruit employees, somewhat after the manner of the Federal Civil Service Commission, is a logical and necessary part of any scheme for training. Such an officer on a large railway could secure the accomplishment of all the advantages of the government's system while avoiding its disadvantages. In recommending an "efficiency wage" and a seniority wage, to be computed or awarded separately, Mr. Eaton only recognizes, what everybody knows, that horizontal advances or reductions and blind adherence to labor union schedules often do injustice to many individuals, and in the case of others do injustice to the employer. In short, our author has only put in systematic and vigorous form what many railway officers have already thought of vaguely or have tried timidly. One manager, Mr. Kruttschnitt, has begun to carry out most of these advanced ideas in systematic fashion. There would seem to be no good reason why many others should not follow his example. Surely no one should neglect to do so on the plea of being less able than the Harriman lines to appropriate the money, for there can be no doubt that the training of employees in efficiency is as wise for a poor road as for a rich one. A poor road is less able than a rich one to get along with inefficient men, and as a matter of fact the managers of

weak lines have often shown their wisdom by paying higher salaries to get competent officers away from a strong road. It would be equally wise to spend the money for the slower improvement that may be had by making the younger employees in all departments more efficient. In his closing paragraph Mr. Eaton predicts a millennial condition of railway life; but there is nothing to hinder any manager from beginning at once to help in the bringing in of that millennium.

The general indictment of some features of American railway permanent way made by Mr. Drinkwater in a letter in another column is interesting. It escapes being commonplace, although it formulates what everybody knows. Mr. Drinkwater is district roadmaster of the Temiskaming & Northern Ontario Railway, has had long experience and tells his woes simply. His letter was accompanied by a sketch, which we do not publish, showing a standard section of rail with the web bent inward a quarter of an inch to the end of producing something like an inward cant, and provide more direct resistance to spreading or overturning. On all British railways the rail is so blocked in its chair as to stand with an inward cant of about one in 20. The wheel treads also are coned about one in 20. This, undoubtedly, is an improved way of using the material for the sole result of resistance to spreading or overturning. It has two indirect results; one good and one bad. Comparing the brake trials made in England and in America, with everything in both cases in as good order as possible, better results have been gotten there than here, and it has been commonly assumed that their quicker stops were due to these coned wheels and canted rails. On the other hand, British trains, running at a uniform speed, quickly develop swaying from side to side, uniformly and rhythmically—a feature in train riding which is not often observable in this country. It does not seem to be dangerous, but it is somewhat disagreeable. There is, in this country, an increasing difficulty due to a tendency to spread the rail and resulting in either considerable cutting of the tie by the outer portion of the base of the rail or bending of the tie plate when it has not been reinforced, or other similar manifestations of the tendency. On one considerable road this has become so marked that the order has been given to set the tie plates out until the inner edge is flush with the inner base of the rail. Of course this requires tie plates with spike holes properly placed for this purpose. In this case the tie plates used are heavily reinforced by ribs, and it is believed that their resistance to bending will to a considerable extent overcome the tendency of the rail to tip outwardly. On another road, for the same purpose, they have designed and are using a shoulder tie plate that is $\frac{1}{16}$ of an inch thicker on the outside than it is on the inside. This is easily rolled and produces a slight cant of the rail inwardly, and would seem at first sight to be rather an attractive way of overcoming the tendency, although one might say that if any thickening of the tie plate on the outer side were justifiable the amount should be considerably more than $\frac{1}{16}$ of an inch. What is the objection to canting the rail inward? It is not believable that it would be accompanied by that transverse oscillation observed on English railways, and probably due to their coned wheels. It may be said that the wheel flange curves will not fit a rail so tilted; it may also be said that such a fit is not extremely desirable.

In his speech at the annual dinner of the Traffic Club of Chicago on February 8 United States Senator Cummins of Iowa expressed the opinion that railway freight rates in this country on the average are reasonable. Most complaints at present are that there are discriminations between communities. The Interstate Commerce Commission cannot raise rates. It can only correct discriminations by reducing them. Mr. Cummins said he did not think the law in this respect is fair. The commission should be given power to correct discriminations by raising rates that are too low as well as by reducing rates that are too high. The *Railway Age Gazette* has several times pointed out the injustice of the law as it stands and advocated increasing the commission's power as Senator Cummins suggests. Not only is the existing law unjust to the railways, but under it the commission cannot permanently stop, and any discrimination that a railway may be determined to continue, as if the commission reduces rates to one community which are relatively too high, the railway may reduce rates to a rival community and thereby restore the relation of rates that the commission has condemned. The desirability of giving the commission power to readjust rates by raising as well as by reducing them seems so plain that it is inexplicable that this change is not among the numerous modifications of the law that are proposed in the bills the administration has caused to be introduced in Congress or in any of the numerous other bills for the amendment of the Interstate Commerce act that have been introduced, including that presented by Senator Cummins himself. The Interstate Commerce Commission has asked for various increases in its power but it never asked for this one. If it could be thought that the commission was inspired mainly by political motives it might be suspected that it wished to leave to the railways all the odium for making advances in rates, but it is not to be doubted that if it possessed the power to advance railway rates it would at times exercise it in a salutary and effective way.

The report, summarized in another column, of the Massachusetts special commission on the relations with that state of the New Haven company is conservative in tone and, to some extent, suggests a temporary working hypothesis. But it leaves unanswered certain basic questions in a controversy which reaches out into broad and deep dimensions of law. Given in two or more states separate charters of the same railway corporation, to which state is the corporation amenable when the railway statutes of those states conflict? Is the corporation under the jurisdiction of one state or all? Is the jurisdiction of one of the states exclusive as to local acts of the corporation, and where is the distinction to be drawn between general acts and local acts? One can see the distinction between an issue of new stock and the local erection of a railway station, or the abolishment of a railway crossing, and argue, reasonably enough, state control of the latter. But the validity, under multiple state charters, of new stocks or bonds to build, say, a big terminal, is liable to be much more confusing when statutes clash. To make the illustration more realistic, Massachusetts holds that the New Haven company must ask her permission to finance the Harlem improvements. The New Haven, on the contrary, claims the power to finance them under its Connecticut charter; and the Supreme Court of Connecticut, in a case very recently decided, has found that the New Haven is held by its contracts, whether in violation of Massachusetts law or not. Whether the New Haven will accept as a peace offering the plan of the Massachusetts commission we do not know. But it would be an acceptance and acknowledgment of a scope of Massachusetts jurisdiction which the company, resting always on its Connecticut charter, has steadily rejected. Indeed, the corporation has gone further and intimated more than once in the past that it would be glad to forfeit its Massachusetts charter covering, as then asserted, only six miles of owned road between Springfield and Connecticut state line. Such are a few of the elements in an acute controversy filled with interstate law points which, if they might speedily reach the higher courts for settlement would project light into obscurity.

RAILWAY MARKET GARDENING.

The Long Island Railroad market gardening experiment stations are this year expected to be self-sustaining; that is, the sale of fruit and vegetables are expected to about cover cost, and this remarkable result may interest other railways which are in various ways undertaking to teach people along their lines how to get money out of the ground. In the central and easterly portions of Long Island the great acreage of barren land attracted the attention of Ralph Peters, the president of the railway. It was sparsely covered with scrub oak and jack pine, was dry and unproductive and commonly called $15-an-acre land. Mr. Peters believed that it ought in some way to be made capable of producing a living for those gardeners who went at it in an intelligent and scientific way. He believed that it was the company's duty to find out the truth and make it known. He made a moderate investment in two pieces of land, established Mr. and Mrs. Loring in charge of these experimental stations, as they were called, and evidently made a wise selection. It had all the elements of pioneer farming, beginning by cutting the trees, blowing out the stumps, driving wells, building, plowing and planting. In choosing fruits and vegetables for planting the Lorings searched the whole world, judging as far as possible beforehand what garden products were adapted to the climate and soil, and then planting and caring for them, not in a highly artificial way, but in such fashion as an average farmer or gardener would be quite equal to, if they were shown how.

After two years of experimenting it was quite clear that the barren lands on Long Island could be cultivated at a profit, and further that the present market gardens on Long Island could be made to pay a very much larger profit than they were paying. The accounts had been carefully kept and this much was plain. The company then authorized a fortnightly publication called *The Agronomist*, edited by the Lorings and made bright and neighborly, and these publications were given away to Long Island citizens and sent to prospective market gardeners everywhere. This magazine has since become a monthly and a really valuable publication.

To one who knew Long Island five years ago and who examines the country now, no statistics are needed to show a tremendous improvement, both in the quantity of ground under cultivation and of the quality of the cultivated areas. Furthermore, the exhibits which the company makes at the fairs show fruits and vegetables of a quality possibly never before known in this country. The number of Long Islanders engaged in market gardening has increased, the improved quality of their product results in the best prices and the tonnage and other earnings of the company, identified so far as possible as being due to this market gardening work, have largely increased. It is during this period of five years that the Long Island has developed from a summer road to an all-year-round road; that is, it has arrived at a point where it earns its expenses in the winter time, which it never did before. A considerable part of this result—how much cannot definitely be said—is due to the development of the products of the soil. It is quite possible for figures on this subject to be misleading because, due to climatic reasons, the potato crop or the cauliflower crop has either partial failure or unusual success in any one year. Nevertheless, taken as a whole, the tonnage record of berries and three kinds of vegetables for a series of years is strong collateral proof of the results of observation.

Comparative Shipments by Freight for the Six Months Ending Dec. 31, in Tons of 2,000 lbs.

	1903.	1904.	1905.	1906.	1907.	1908.	1909.
Berries	651	242	366	616	214	327	328
Cauliflower	12,715	8,968	9,849	4,678	8,784	11,346	17,770
Cucumbers	516	360	167	722	832	1,282	2,683
Potatoes	29,993	41,198	35,701	38,570	40,070	41,894	55,961
Total	43,875	50,768	46,083	44,586	49,900	54,849	76,742

Shipments by express are not included.

Total number of carloads 1909..... 5,200
Total number of carloads 1908..... 3,585

The records for the years 1903-1907 are given as indicating no material increase in that period before the experiments were a factor. The variants are such as might be expected from different seasons. The increase of 40 per cent. in 1909 over 1908 is believed to be largely due to the experiment station work.

EFFICIENT LABOR.

Really efficient labor can only be obtained and continuously maintained when the three following conditions are fulfilled, viz:

That the method of working is the best we can devise.

That the workman is trained to become expert in following that method.

That he is rewarded liberally for success.

If these three conditions are intelligently adhered to the employer can pay his workman higher wages than any union will ask.

We all know that unless workmen are trained alike, hardly any two will do the same piece of work by exactly the same method. There is a best method of doing everything, but we seldom arrive at it without careful study. As a matter of fact, the only way to find the best way of doing a piece of work is to analyze it into its elementary operations and determine separately the best way of doing each element. We can then find the time needed for each element and hence the time needed for the whole operation.

Having found the best way to perform each elementary-operation, and the time needed, we have but little difficulty in persuading a workman to do as we wish, provided a patient teacher directs him and a suitable reward is given him for success.

Not all that try will succeed at first, but those that succeed quickly will act as an incentive to the others, many of whom will gradually acquire the necessary skill and fixity of purpose. The writer has seen workers who took eight months to acquire the necessary ability to perform a task, but when they had acquired the ability they became absolutely reliable and steady.

The reward needed to cause workmen to subject themselves to this course of training varies with the difficulty of the task from 20 per cent. in addition to their day's wages to 100 per cent. If the work is such as does not cause the worker to be physically tired at the end of the day, but requires only more attention to his work, a bonus of 20 per cent. is sufficient.

If, however, the work is such as not only requires his constant attention, but causes him to become physically tired he requires a larger bonus; and if in addition the conditions under which he has to work are disagreeable he requires a larger bonus still, which may reach as much as 100 per cent.

Analyzing an operation into its elements and studying them is not easy. It presupposes a trained mind and a patient and accurate observer. Unless this work is done well the money spent on it is wasted, and to put a stop watch in the hand of the ordinary clerk with instructions to study a job excites only the ridicule it deserves.

When, however, the work is done by a trained observer, and the workman has gotten into sympathy with it, the results are beneficial to a degree that is almost unbelievable.

Proper study is absolutely essential to highest efficiency. The method of compensation is not so material, provided the amount for success is liberal and the workman does not have to sacrifice his day's wages while acquiring proper skill and habits of work.

The fact that properly trained workmen will often do three times as much work as those whose training has been poor, and that the extra compensation needed to get the efficient work is very rarely over 50 per cent., is the best argument for systematically training workmen.

As a matter of fact, money spent in properly studying pro-

cesses and training workmen brings a return far in excess of any other investment, for not only is the wage cost per piece often cut in half and the output trebled, but the increased output is often gotten with practically no permanent increase of "overhead expense."

If the reader wishes to understand what this really means in the way of profits, let him figure out what it would represent in his own business.

BRITISH LOCOMOTIVE PRACTICE.

Foreign motive power officers have frequently favored the profession with complete descriptions of their locomotive practice, usually in formal papers for the Institution of Mechanical Engineers. Notable among these are the paper by Mr. Johnson, which gave a technical description of the locomotives on the Midland Railway and their performance, and those by E. Sauvage, which include valuable data on the performance of 4-cylinder compound locomotives on the French lines. Prominent also are the papers of Mr. Aspinall, who was chief mechanical engineer of the Lancashire & Yorkshire Railway before becoming general manager, and more recently, his mechanical successor, George Hughes, has presented a paper on the locomotives designed and built at Horwich, with the results of their service. This paper contains valuable data about recent locomotive practice in England and a brief summary of some of the principal facts and figures may be found of interest to American motive power officers.

The large locomotive plant at Horwich was completed in 1889, and more than 1,000 locomotives have been built there, the total equipment of the road consisting at present of 1,517 locomotives. With the exception of a few of the smaller engines and motor cars these have been standardized so that there are now only twelve principal classes of locomotives, and the majority of them are fitted with the Joy valve gear. It has been found possible to use the same sized gear for engines having 17½-in. cylinders up to the larger ones with 21½-in. cylinders. On this line corrugated tube fireboxes were extensively used, but not with very satisfactory results. Mr. Hughes states that the circulation in this type of boiler is poor and compares unfavorably with the stayed firebox boiler in this respect. It is also objectionable on account of its tendency to prime. Halpin's thermal storage heater is also used on six engines. This device is found economical where stopping places are frequent on rising gradient and results in a saving of 12 per cent. of water. When, however, the engines take their turn on other sections of the road the showing is not so favorable. The Schmidt superheater has been applied to 25 locomotives, and gives the advantage of higher initial pressure in the cylinder and therefore a greater range of expansion, while condensation is less. Engines which ordinarily had 18-in. cylinders were increased to 20 in. when built for the superheater, and at the same time the maximum steam cut off was reduced to 70 per cent.

The type of locomotive adopted for heavy passenger and express freight service on this line is a 4-cylinder, simple 10-wheel engine, which has a number of advantages from a mechanical standpoint, such as the division of stresses in the driving machinery, the superior balancing and the greater range of expansion obtainable with the simple engine at the higher speeds. The slide valves are operated by the Joy valve gear on the inside main rods and the outside valve stems are moved by horizontal levers extending from a small crosshead or slide block on the inner valve stem. The Belpaire boiler is standard on this line and is preferred on account of its advantages in increased steam and water space, additional surface on the back head for mountings, and the direct staying of the crown. Copper and steel tubes are used and in a period of 8 years their respective lives averaged as follows: Copper, first period, 110,000 miles; second (stretched), 80,000 miles; third (pieced), 50,000 miles. Steel tubes, first period, 80,000 miles; second (pieced), 40,000 miles. Copper fireboxes average 150,000 to 275,000 miles. The author gives an instructive account of his experience with crank axles, and states that in 1901 it was necessary to abandon the solid forged crank axle on account of the heavy stresses due to larger power, and the built-up type was then adopted as standard. In 1905 rectangular keys for these built-up cranks were abandoned and screw keys 1½ in. in diameter, six threads per inch, were successfully introduced. The crank axles are made of .035 carbon steel with straight webs. The shrinkage for an 8¼-in. hole is .018 in., which amounts to 1/458 part of the diameter. The heating of journals or crank pins in built up crank axles must be carefully safeguarded as it is apt to cause trouble. The minimum thickness of tires is 1½ in. up to 68 in. and 1¾ in. above this. The greater thickness was found necessary on account of loose tires. The hardness and strength of the tire steel was also increased from 84,000 lbs. to 96,000 lbs. per sq. in. Previous to 1908 the tire shrinkage was not quite proportional to the diameter, being too large for small tires and not sufficient with large tires. The rule was then revised and now stands at 1/750 of the wheel center diameter for all sizes. In the same year, 1908, the American Master Mechanics' Association adopted two shrinkage figures, allowing 1/80 in. per foot below 66 in. and 1/60 in. for 66 in. and over. For the larger tires this is equal to 1/720 of the wheel center diameter and very close to the English practice.

Mr. Hughes' paper contains the results of experiments relating to smoke box draft appliances, brick arches and ash pans, and he says that while attempts have been made in America to standardize the front end fixtures, and with some degree of success, yet he believes that each new design of locomotive demands some experimental work in order to arrive at the best steaming position of the blast pipe diameter of chimney, etc. He concluded that a long smokebox is desirable as it tends to equalize the draft and his tests with the exhaust pipe at various distances from the tube sheet showed that a position midway between the door and tube sheet was preferable. In recent designs for British locomotives is seen a disposition to use a baffle plate and it will be interesting to find that when foreign practice forces the locomotive to maximum power as in America, the baffle plate will be found necessary and the draft appliances may resemble those which have been slowly evolved in this country.

A design for an improved ash pan which is illustrated in Mr. Hughes' paper has a wide air duct connecting the front and rear portions where they are divided by the axle guard so that the air current from the front damper may pass to the rear grate. The paper is illustrated by handsomely engraved cuts of Lancashire & Yorkshire locomotives and their details, with tables and diagrams, which give one a good idea of the service and performance of English locomotives. It is the kind of a paper we should like to see presented occasionally to the American Society of Mechanical Engineers by some of the superintendents of motive power of our American railways.

NEW BOOKS.

Accounting Every Businessman Should Know. By Elisha Ely Garrison. Published by Doubleday, Page & Co., New York, 1909. 188 pages; cloth. Price, $1.20.

Mr. Garrison has had a wide experience in practical accounting, and he writes this book with the avowed purpose of explaining away the obscurity which frequently hides the real values and objects of accounting. His chapters cover the origin and foundation ideas underlying accounting systems; the transition to modern methods; the reorganized ledger system; opening the ledger; closing the ledger; account characteristics; valuation and reserves; the inventory ledger; department costs; the principles of cost accounting; devising of systems; statement of results; accounts and the manager,

and accounts and the directors. The author recognizes the fact that his work involves a good deal of repetition, but this is rather helpful than otherwise to the reader who is not an accountant. This book is quite sure to be helpful to the factory manager or the office manager or the production manager in almost any kind of business, unless this man has been thoroughly trained as an accountant, and it would help a good many accountants to make their reports understandable to non-technical owners and directors.

Letters to the Editor.

METAL TIES AND CAST-IRON CHAIRS.

Guadalajara, Mexico, Jan. 19, 1910.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

A question has recently come up among some members of our small foreign club, and we have decided to apply to you, as authority on all railway matters, for the answer.

Mr. Newel, a well-known member of the American colony here, is the inventor of a metal sleeper or chair for securing railway rails in proper position, and when the accounts came of two recent costly disasters, one on the "Southern" and one on the "Rock Island" roads, caused by insecure fastenings, it started the discussion: Why do not the roads use metal sleepers and chairs, as in England and on the continent, to secure the rails?

One argument was that it was too expensive, but the account says either of the derailments named will approximate $100,000 loss. Now that amount will provide 100,000 chairs @ $1 each, or 28,371 metal sleepers @ $3.50 each.

Allowing 100 sleepers to the curve, it will provide for 283 curves. Allowing 200 chairs to the curve, it will provide for 500 curves, and this small number of either sleepers or chairs to each curve will give a factor of safety at least ten times greater than is now obtained with spikes alone, hence the argument of expense does not seem tenable.

So we respectfully refer the question to you.

HENRY LEYTON.

[Sir Henry Leyton asks two questions. The use of metal sleepers, or ties, and the chair system is separable. Metal ties have not yet shown good results with heavy axle loads and high speed combined. They do apparently good service on the Bessemer & Lake Erie with heavy loads at low speed, and good service in Europe with light loads and high speed. In this country the inverted-trough ties have broken down, and those of rigid forms have developed dangerous tendencies. The breakage of fastening clips has been alarming and in some cases disastrous. These clips have been designed to hold the rail firmly to the ties, with no elasticity and, indeed, with no resiliency. The upward wave traveling along the rail in front of the rolling load probably needs to be reckoned with. In frozen ballast, with the ties firmly held, and with rigid clips that are strong enough, the upward wave has some dangerous work to do.

The English chair system has so many economical advantages that it has always been attractive. The rail being raised about an inch and three-quarters above the tie enables the trackmen to tamp up the sleepers and maintain good surface with much greater precision and in much less time than where the rail bears directly on the tie. The maintenance cost of chair renewals is minute. The worn out and broken chairs are melted and new castings made at the cost of only a few cents each, and they last a great deal longer than does a tie plate. The trouble is that cast-iron chairs probably cannot be made strong enough for heavy high-speed.

About 20 years ago the Pennsylvania Railroad was supplied by the London & North Western Railway Company (England) with one mile of rails, chairs, fastenings and metal sleepers, and another mile of the same material with wooden sleepers. Also, the London & North Western sent over a few skilled men to see to the installation of this track in the Pennsylvania Lines. It was only a very short time before it was completely broken up.—EDITOR.]

MODERN SIGNALS ON WESTERN ROADS.

Chicago, Feb. 7, 1910.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I note in your synopsis of the testimony of Mr. Ames before the New York State Public Service Commission on the Croton collision (February 4, page 254) that Mr. Ames, replying to a question, said that the upper quadrant indication of signals is used on the New York Central, the New York, New Haven & Hartford, the Pennsylvania and the Baltimore & Ohio. Perhaps it is just as well to call the attention of the public to the fact that progress and modern methods in signaling are not confined to the country east of the Allegheny mountains. During the past year the Rock Island alone has installed upper quadrant automatic block signals on over 300 miles of line. The C., M. & St. P., the Santa Fe, the Soo Line, the Great Northern, the Northern Pacific, the Chicago Great Western and the Frisco, the latter with 720 miles in service or under construction, are a few examples of western roads that have adopted the upper quadrant.

If you have reported Mr. Ames correctly it may be charitably assumed that he was simply thoughtless; but the statement as it stands sounds very much like some assertions made at Chicago last March, when eastern signal engineers attempted to belittle western ideas and methods, at the meeting of the Railway Signal Association.

V. C.

EDUCATION IN POLITENESS.

Rochester, N. Y.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I read in the daily papers that the Union Pacific has opened a school for deportment and etiquette. It is said to be under the management of D. C. Buell, who is going to educate the employees of the company as to how they should best conduct themselves when meeting the public. Nearly 1,000 employees are now enrolled in the school, and additional applications are being received daily. It is said that the management will try to develop men who are good at reading human nature and capable of being a "mixer."

There are several funny things in this announcement. Why so few as 1,000 pupils? Aren't there about 20,000 on the U. P. who need to be refined? If not it is unlike all other roads. What do they mean by "applications"? Who ever heard of a railway employee that voluntarily moved toward a higher standard of courtesy? And then those last two requirements! Do they expect to cultivate the qualities of the railway lawyer and the general passenger agent in the lower grades? Think of a passenger brakeman who is a good mixer! In one sense, however, some of them are too expert in this respect already.

But I am not writing to criticize, or to ridicule. It is a good scheme. I suggest, for the first lesson, that passenger trainmen and baggage agents be notified that they will be fined 50 cents every time they address a woman as "lady" instead of "madam."

G. C. S.

AMERICAN RAILWAY APPLIANCES IN THE SOUTH AMERICAN MARKET.

Buenos Ayres, Argentina, Jan. 2, 1910.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

In view of the interest which is now being taken by the United States in the South American market it may be of interest to you to have some particulars of the market for railway appliances as it strikes me out here.

The first thing that strikes one when starting in to ex-

amine this proposition is that Argentina is in a class by itself. Here the railways are preponderatingly British, both in their stockholders and in their management, and are practically controlled from London. There are, of course, a number of narrow gage lines under government hands and controlled by French companies. These, however, do not cut a very large figure at present with the broad gage lines.

In Chile, Peru and Brazil, however, the proposition is different. In Chile the lines are state owned, in Peru they are worked by the Peruvian Corporation, an Anglo-American corporation, while in Brazil, Canadian and American investors are all the time getting a stronger control although there are a number of British controlled lines also.

The important thing about the railway exhibition to be held here this year is that the operating officers of all these lines will visit it, not only the general managers who get to Europe every year, but the officers of the smaller systems who do not often get a chance to see up-to-date plant.

At the present time there is not a great deal of American rolling stock in use on the Argentine railways, nor a great deal of machine tools, though heavy wheel lathes and specialties of that kind are very popular.

The British section at the Exhibition will, of course, be the largest, but an energetic American committee under the presidency of Pemberton Smith, the local representative of the United States Steel Corporation, has been formed, and it is hoped that a fairly good American exhibit will be shown. The lack of business hitherto has not been due to any particular unreasonable prejudice against our own products as is seen by the fact that the steel structure for the Railway Clearing House, which is, of course, a British controlled concern, has recently been purchased from the United States Steel Corporation. In my travels, moreover, I have met more than one American built locomotive, though not many of recent type.

Those of our manufacturers who are prepared to go to the expense of exhibiting at the exhibition and follow up the enquiries they obtain will, I think, be able to do good business. Even if they will not go to the expense of running a stall themselves they can share part of one with another firm or, even more modest still, they can exhibit a line of photographs of some of the most recent orders they have carried out. Failing this they can probably, with advantage to themselves, obtain considerable publicity among the exhibition visitors by advertising in the official organ to the exhibition.

It is said out here that 75 per cent. of the British exhibits have already found buyers in the country, and I believe the same to be true of the German exhibits also. Very few houses out here carry a big line of machine tools, for instance, and a very good machine tool that comes out here and is seen at work, like a good motor car, is generally bought pretty soon, but, of course, it must be a tool that is suited to the conditions of the country. Full automatic machinery is not so suitable as semi-automatic as the class of labor to be obtained is not very skilled, neither is it excessively expensive, nor is the run of identical things to be turned out sufficiently big to warrant the use of much automatic machinery.

Electric current or gas is being supplied at the exhibition at fairly stiff rates, but electric light is free. There is also a small charge for water. The British Board of Trade has appointed a special commissioner to look after British interests and he has already been out here once and is expected out here again. American interests would have been better served had a similar appointment been made, but it is now rather late to do this as the exhibition opens in May, although it will not probably be in full swing until July. Lists and advertisements should be produced in Spanish and photographs of plant supplied to English-speaking countries and companies will, I think, owing to certain inter-racial prejudices in South America, do more good than descriptions of plant supplied to other South American states.

TRAVELER.

BAD TRACK.

Englehart, Ontario, Canada, Feb. 7, 1910.

To the Editor of the Railway Age Gazette:

Without being too pessimistic or preaching blue ruin, and while I believe in making use of every known device that will accomplish ends expediently and save labor, nevertheless I believe there are matters of great importance facing everyone interested in the maintenance of way on our Canadian railways. At least I am inclined to believe that we have nothing that should be called permanent way, a term that is very often applied to what we call track.

I have seen track for the past 35 years being built and put up in what was called first-class shape, and in a very short time it had gone to pieces only to be gone over and rebuilt.

The old 56 and 60-lb. rail have given place to the 80 and 85-lb., and in some places the 100-lb. rail, but we find that the same lack of permanency exists as did with the lighter rail and our track is practically no better than it was 25 years ago.

Tie plates have been introduced to save ties, but they do not save them. The only increase the life of the tie possibly 15 or 20 per cent. The rail of the heaviest weight does not do its work.

We find after a few months' service it is canted over on its outer corner and the remedy is to cut the tie to pieces to straighten it up again. Every day we hear talk of adzing down on this curve and that curve before the rail gets too badly canted.

Every year it is necessary to take a piece here and there on a division and practically rebuild it in order to keep it in shape to do business. Every five or six years it is necessary to relay rails, taking out rails that should have been good for 25 years.

This, to a great extent, is for the want of proper joint fastening. Then our rails are made symmetrical, while all the force against them in on the inner side, and they must, and will, and do roll over on to the outer lower flange or base. Then we get hundreds of broken rails, which is far in excess of failures by breaking in any other class of railway equipment, yet they are, to a great extent, the standard section adopted by the American Society of Civil Engineers.

They are not a bit better than the old ones. What we really need is a rail that will stand up in its place and do its work with sufficient weight and stability so as not to squirm under its load as if it was made of rubber. Then we want a joint fastening that will support the rail ends from underneath (there are several of those on the market that does this fairly well); then so long as we use wooden ties we must put enough of them under the rails to support them whether tie plates are used or not.

I am perfectly safe in saying that the track of railways is their very weak member compared with other equipment of all classes, and track will never be what it should be until there is equalization given to the rail itself to counteract the force against the inside of it, and this can never be done with the present rail section; and before we get any more devices to do track work with we should get track to work on different to what we have at present.

One great trouble with track is spreading. Numerous derailments have taken place from this cause, and requires, during the winter season, constant vigilance to avoid accidents.

Entire passenger trains, with the exception of the engine and some of the forward cars, have been ditched by track spreading.

The cause of this is lack of stability in the track, showing clearly that our tracks are not all in keeping with other appliances on our railways.

J. DRINKWATER.

LIMITED SPEED OF PASSENGER LOCOMOTIVES.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

Having read your editorial and Mr. Fry's letter to the Editor January 28, and being a mechanical engineer who has devoted considerable time to the study of locomotive construction, both in America and Europe, I am unable to resist the temptation to enter this discussion.

I wish, first, to agree with Mr. Fry to the extent that the above editorial humiliates the modern express locomotive somewhat more than the actual facts appear to warrant; second, to present some simple data on the ratios of tractive effort to train weight in 1898 and 1910, and third, to discuss briefly the means at hand for enabling the passenger locomotives of to-day to better cope with the more and more exacting conditions which are daily forced upon them.

The editorial states that a 6-car train was recently made up for test purposes which was intended to represent modern express equipment, and that the Pacific locomotive, which was selected for its good record on the line in question, was unable to accelerate the train to move more than a fraction above 60 miles an hour on level road with favorable weather conditions obtaining.

There can be no question as to fact in this instance, but there is a reason for this poor performance of a modern Pacific locomotive, and it must be looked for in the locomotive, since the track was level, the train normal, and the weather conditions satisfactory. Furthermore, if the name of the road in question and the principal dimensions, weights, etc., of this locomotive were known there is not the slightest doubt in the writer's mind that the poor performance could be quickly explained.

I have made many trips between New York and Chicago on the "Twentieth Century Limited," and I have ridden mile after mile in 50 seconds or less when the train consisted of six and seven cars and was hauled by a Pacific locomotive weighing about 261,000 lbs., with 79-in. driving wheels, 4,195 sq. ft. of heating surface and 22-in. x 28-in. cylinders. This equipment, while not built of steel, is certainly not out of date, and, furthermore, to one sitting in the buffet car next to the engine, everything showed that the locomotive was not worked to the limit to hold 72 miles an hour with such a train.

If this can be done on one road with a certain type of engine it can be done on any other road with the same engine and substantially the same road conditions.

Many observers are therefore inclined to the belief that the speed of modern express trains in general is limited more by traffic conditions and schedule agreements with competing roads than by the locomotives.

On the Atlantic City runs in 1898 the trains weighed on the average about 190 tons. The locomotives used on these runs had a tractive effort of 14,350 lbs. when working compound. The ratio of train weight to tractive effort is therefore 26.7.

Taking the weight of a modern sleeper as stated in the editorial as 75 tons, five of such sleepers would weigh 375 tons, and with one buffet car of 50 tons the total weight of train would be 425 tons. The tractive effort of the locomotives which handle the "Twentieth Century Limited" is 29,200 lbs., and the ratio of train weight to tractive effort is 29.1. It is true that the above tractive efforts are not realized at high speed, but as they are both determined for the same M. E. P. (per cent. boiler pressure) the comparison is not mitigated.

From the above ratios we should expect the present day Pacific locomotive with a modern train to maintain a speed that was 95 per cent. of the speed averaged on the Atlantic City runs in 1898 which I believe averaged 72 miles per hour when the train started late. We should, therefore, expect our 1910 Pacific locomotive to maintain 95 per cent. of 72 or 68.4 miles per hour, and this on the assumption that there has been no improvement in locomotive performance for twelve years.

The writer has known the above described Pacific locomotives to take a train consisting of five Pullmans and three day coaches 43 miles up grade all the way and reach the latter point in 48 minutes from a dead stop. Not once, but many times. It is needless to say that such a performance requires that a speed in excess of 60 miles per hour must be maintained up hill after the train is under way a few minutes. Many other instances could be cited but such is not the purpose of this article.

In view of the above there is some justification in refusing to believe that our modern locomotives cannot maintain a speed of 70 miles an hour with a 6-car train on level track.

Let us presume, however, that our locomotives of to-day cannot maintain 70 miles an hour on a level road with a normal 6-car train. What can we do to improve the locomotive? If the Mallet locomotive was successful in meeting the requirements of higher speed for heavier freight trains, perhaps the Mallet type of passenger locomotive would do equally well in the passenger field. But before resorting to the Mallet, or better still, simultaneously with that course, let us be certain that we have exhausted the possibilities of the Pacific locomotive, for instance.

It is generally conceded that a four-cylinder locomotive with two cylinders between the frames is better adapted to high speed work than any other type at present in use. One of the principal reasons for this is the fact that reciprocating parts of the inside cylinders can be made to counterbalance those of the outside cylinders.

If an engine has four cylinders it should certainly have four valves if it is intended for high speed service. If it has four high-pressure cylinders four valves will give double the port area to any one cylinder that two valves would permit, and port area is a most important property. Four valves also permit less tortuous passages. If the locomotive in question is a compound, four valves are needed so that the ratio of cut-off in the high pressure to that in the low pressure may be varied. It is useless to argue that a fixed cut-off ratio in a compound engine can give as good results as a cut-off ratio which may be varied to meet different conditions, be the engine bolted to a foundation or mounted as a locomotive. One might almost as well expect a simple locomotive with its cut-off fixed at ½ stroke to perform equally as well as one having the usual means of shortening the valve travel. As stated in the January 28th editorial the latest locomotives on the French roads maintain the four-valve arrangements and not long ago the writer was afforded an opportunity to ride on a French de Glen compound between Calais and Paris on the Nord Ry. on the fastest train on that road when the value of four valves and double valve gear was demonstrated to him in a manner not to be soon forgotten. When the subject of the greater complication of four valves was mentioned to the French engineers they replied that the American air brake was "very much" complicated and asked who would consent to reduce complication at the cost of loss in efficiency.

We must admit that the P. L. M. de Glen Pacifics illustrated in the *Railway Age Gazette* of January 7, 1910, are a splendid example of modern locomotive construction along the line of meeting increased speed and weight requirements. If these machines are fitted with double valve gears and four valves there is "food for thought" for American locomotive designers.

German practice is very similar to the French, and in England there are Pacific locomotives with four 15-in. high-pressure cylinders, and if I am not mistaken the London & South Western has 4-6-0 locomotives with four 16-in. high-pressure cylinders.

The American locomotive designer has little to learn from English locomotive practice that is applicable to his needs, but this cannot be said of French and German locomotive designs. If it is true that our present locomotives have reached the limit of speed, and if that speed is 60 miles per

hour with normal trains, it is time to look well around us; to recognize and take advantage of the experience which others have gained, and the lessons they have learned, and to apply them to the solution of our problems wherever possible. If necessary build locomotives with double valve gears or four high-pressure cylinders and try them out, but I venture to say that the present day Pacific if correctly designed and operated has not quite reached its limit.

To those who persist in heralding loudly the near approach of the time when the electric locomotive shall overlap the suburban field to displace the steam locomotives on longer runs I would direct attention to the remarks of Mr. Kruttschnitt on the problem of electrification of the Central Pacific over the Sierras as follows [*Railway Age Gazette*, January 14, page 101]:

"Eastern critics may be inclined to the opinion that we are dallying with this matter. We have found that it pays well to make haste slowly with regard to innovations. Electrification for mountain traffic does not carry the same appeal that it did two years ago. Oil burning locomotives are solving the problem very satisfactorily. Each Mallet compound locomotive, having a horsepower in excess of 3,000, hauls as great a load as two of former types, burning 10 per cent. less fuel and consuming 50 per cent. less water."

If the reader fears that the locomotives of to-day are soon to be driven from their field by the electric locomotive a perusal of the splendid paper on the subject of "Electrification of Trunk Lines," by L. R. Pomeroy, in the same volume of proceedings (an abstract of this important paper will be found in another column), will do much to alleviate his fears if not remove them entirely for some time to come.

Finally, granted we had locomotives that could maintain a speed of 90 or 100 miles an hour, would we be permitted to use them? Would it not first be necessary to look well to the curves and the roadbed, and to devote a great deal of attention to the traffic conditions where such speed would be taken advantage of?

If our locomotives were capable of such a performance, and I hope the day will come when they are, even though regular 90-miles-an-hour schedules were denied us, it would be a source of the greatest gratification to know that the locomotives could meet the demand when it was made.

EDGAR LOGAN HILL,
Am. Soc. M. E.

Contributed Papers.

COLFAX GRADE REVISION; SOUTHERN PACIFIC.

BY BRADFORD BOARDMAN,
Associate Editor of the *Railway Age Gazette.*

The Southern Pacific is building a low-grade line up the foothills of the western slope of the Sierras from Rocklin, Cal., east to Colfax. The present main line between these points is 31.6 miles long. It has a maximum grade of 2.2 per cent., compensated, opposing eastbound traffic, and a maximum curvature of 10 deg. This line will be used for westbound traffic, having no opposing grade, and eastbound traffic will move over the new line, 30.8 miles long, with 1.5 per cent. grades and 4 deg. maximum curvature. On the present line there is 18.5 miles of curve track, a total of 5,493 deg. The new line will have 14.2 miles of curve, amounting to 1,344 deg.

At present the eastbound rating for consolidation engines is 480 tons behind tender, and for the Mallet compounds, 1,000 tons. The ratings on the new line, eastbound, will be 905 tons for the consolidations and 1,855 tons for the Mallets. There is very little drag tonnage moved over this district, most of the lading being high-class freight which is given a schedule requiring a smaller train load. The loads now average, therefore, eastbound, 455 tons and 915 tons, respectively, for the two types of engine. Proportionately, when the new line is finished the average loads will be 860 tons and 1,695 tons. Over the present line the power for the heavier freight trains consists of two consolidation locomotives in front and a Mallet about two-thirds of the way back. This revision of grades is to be continued, eventually, all the way over the mountains, but the plans are not yet finished.

The present line is being relocated wherever the new line

Fig. 1—Crossing at Applegate Before Building Subway.

This shows the usual form of trestle and incidentally some of the cheap but effective bracing that can be put in when the foundation of the trestle is undermined.

touches it. In these relocations the curves are reduced to a maximum of 6 deg. No attempt is made to reduce grades, as there are and will be none opposing westbound traffic. In fact, in some cases grades are increased on the relocated line. All curves on the present line are to be reduced to 6 deg., but this will not be carried out until the new line is in operation, except where the lines are together, and at a few points where relocations can be made now without disturbing traffic.

Throughout the work the rock is close to the surface. The hardest rock occurring in large quantities is serpentine. The softest is the slate and clay shale. There is also quartzite,

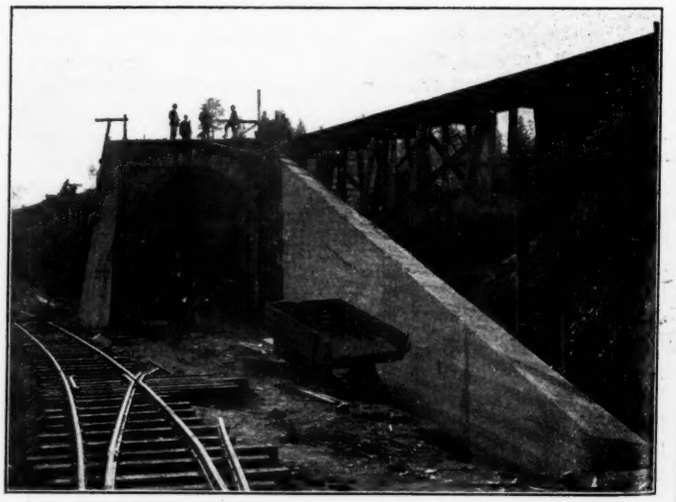


Fig. 2—Applegate Crossing; Subway Nearly Completed.

granite, disintegrated granite, porphyry and clay. In dry weather some of the clay becomes a sort of hard-pan and has to be blasted. On the other hand, the clay shale can sometimes be handled directly by steam shovel. This is unusual, however. It crumbles rapidly after exposure to the air and eventually takes about a 1½ to 1 slope. Hand drills are used in all tunnels except Nos. 13, 7, 5, 4½ and 4, and in all cuts except in one near Bowman. Where the cut work is particularly heavy, a well drill is used, as described below.

The irrigation system adds to the expense of the work. There are storage reservoirs all through the hills and from them ditches run down to the valleys. Where the new grade interferes with them they must be taken care of. This means an unusual number of culverts, and in many cases the ditches have to be diverted for some distance. Sometimes new ditches may be dug, but frequently it is necessary to carry them across depressions in flumes. The pipe lines from ditches to farms are easily handled, being carried directly through fills and over cuts on wire suspension bridges, or on a highway bridge if convenient. There was also a great deal of work done in changing the channels of natural streams. Where one paralleled the line it often had to be moved away to protect the toe of the embankment. This is expensive, as most of the slopes are steep, so that a deep cutting is required for the new channel. Where the line crosses a stream on a fill it was often found practicable to cut a new channel in the side hill so as to take the stream through where the embankment was low and avoid a long culvert under the highest part of the fill. Because of the steepness of the slopes the new channel does not have to be carried far upstream before the stream can be diverted into it, and the drainage area at the bottom of the valley is so small that what water does fall on will seep through the fill without damage.

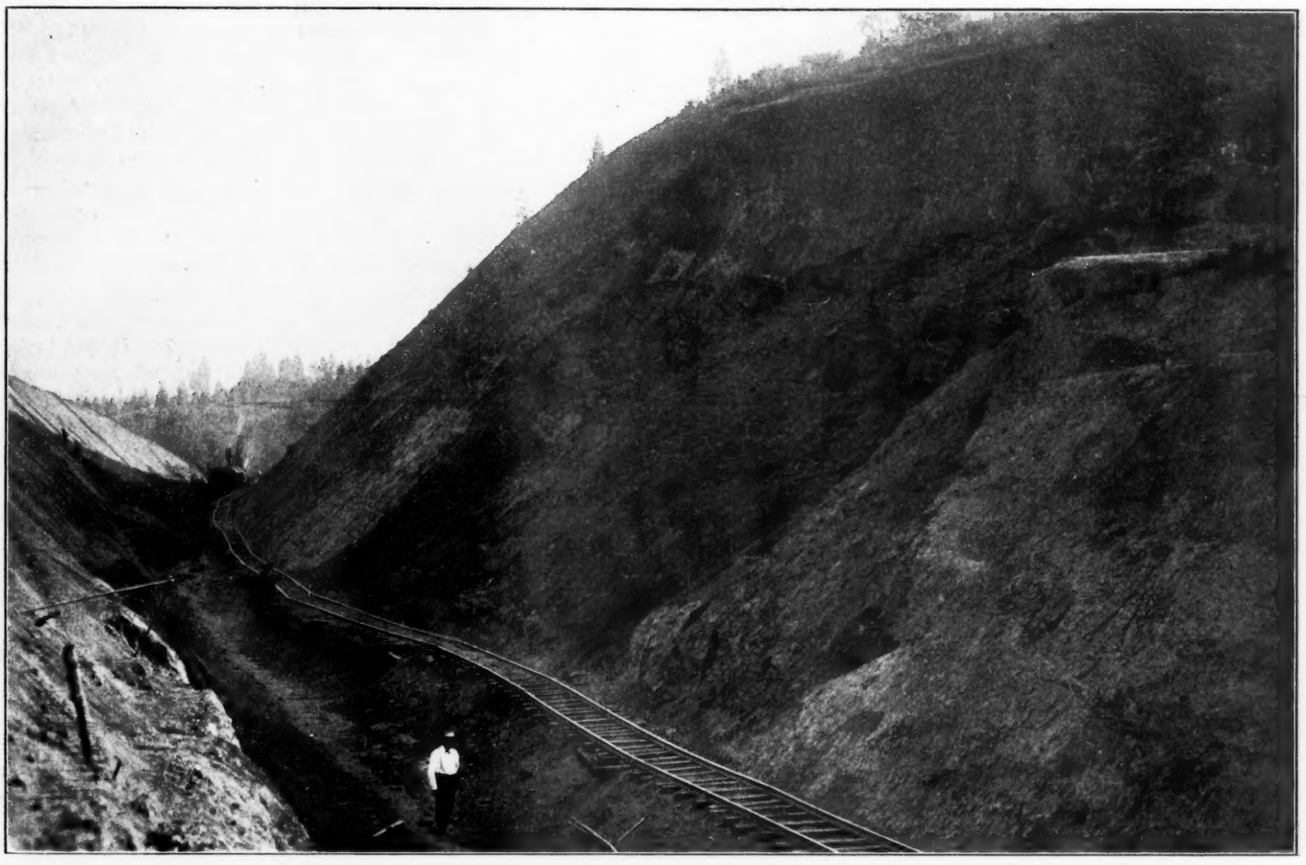
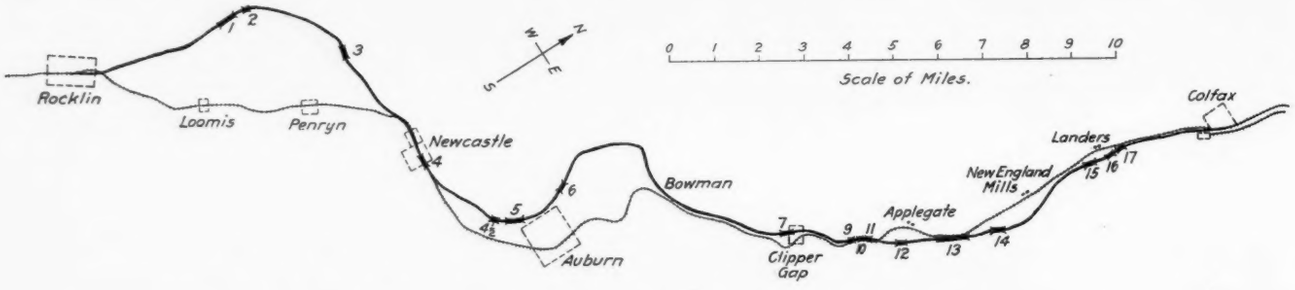


Fig. 3—Slide in a Heavy Cut.

Fig. 4—Timbering at West Portal of Tunnel No. 13.

Where practicable, grade crossings of highways are avoided. The railway bears all the expense of the necessary relocation of highways. There has been considerable difficulty in getting the necessary right of way at reasonable prices. The people would be willing to give it away for a new line, but take just the opposite course when the improvement of an existing line is concerned. A result is that the company has to buy much more land than it needs. At points the original 400-ft. right of way of the Central Pacific had been encroached on, and this resulted in a good deal of trouble. Most of the right of way negotiations are now, however, completed; the company even succeeded in acquiring a corner of a churchyard.

The hardest part of the work is on the portions where the new line is adjacent to the present line and construction has to be carried on without disturbing traffic. The trouble is that in most cases the lines are on different levels. Where they are on the same level and the curvature of the old line is such as can be followed by the new one, the work is simply that of double-tracking. As a matter of fact, however, these conditions obtain only at a few places, except for the first two miles west from Colfax. No construction trains are run on the present operated line, as train service is so frequent that there would be many delays; the electric train staff system being in use, work trains cannot be operated on the main line by flagging. This means that a lot of construction track must be built, and it is often expensive. All grade crossings of construction track and main line track are protected by all-electric interlocking. There are spurs from the operated line to construction camps and to tunnels and heavy cuts for delivery of materials and supplies. These spurs are of the same construction as main line track, i. e., 75-lb. rail, tie plates throughout, with four spikes in each plate on heavy curves, first-class ties, etc., except that the spurs are not ballasted and there are only 14 ties to the rail. There are a number of tunnels and cuts, however, some distance from the present operated line, to which no spur was built, and all equipment was hauled overland, sometimes 2½ miles. At Auburn, for example, locomotives, cars and steam shovels were hauled



Colfax-Rocklin Grade Revision.

Small scale map, showing present line and new eastbound line, but not the relocations of the westbound line, nor the numerous crossings of new line and present line between Clipper Gap and Colfax.

fills is brought from San Francisco, both poles and dressed timbers. The timber which grows nearby is of poor quality, being for the most part a soft, knotty pine.

Electric lights are used in much of the tunnel work, current being supplied by a private power company which has transmission lines through this district. At tunnel No. 13, however, the contractors have their own plant. Electric power was wanted at some points for uses other than lighting, but the power company demanded too high a price.

The Utah Construction Co., Ogden, Utah, has the general contract for the 11 miles from Colfax west to Clipper Gap. It does the tunneling itself, but sublets some of the cut and fill work. Concrete work is let separately by the railway company. From Colfax to tunnel No. 17, two miles, a double-track line is being built. The present line, which crosses the new grade frequently in this section, will be abandoned. At tunnel No. 17 the old and new lines diverge, meeting again at Applegate. The cuts on the double-track section are not very heavy. The material is clay, clay shale and slate. The clay shale is usually too hard to be handled without shooting. On the larger cuts a 3-in. hole is driven by a well-driving machine from the top down to the grade line. At the bottom of the hole a pocket is formed by exploding a small charge of black powder. A heavy charge of dynamite is then put in this pocket; this will shake up a great amount of the shale, so that it is easily handled by steam shovel. This method is used in many cuts on the line, but not in hard rock. No scrapers are used except to make grade for construction track ahead or around the shovel and at points where cuts are quite shallow or short, or where there is considerable burrowing.

through the town for a mile and a half. Track was laid ahead of them and the shovels pulled themselves up hill by cables by their own power.

On the new line there are only two important bridges; these are the ones over the Auburn ravine and over Antelope creek, near Rocklin. Culverts are plain concrete arches, all paved, the smallest having a 4-ft. opening and the largest 12-ft. There are no pipe culverts except some concrete pipe culverts, which have 3-ft. and 2-ft. openings. Culverts have to be of ample size to take care of the volume of water which comes from even a small drainage area in this region. There is, however, no trouble from melting snow, there rarely being more than 3 in. on the ground west of Colfax. Highways are crossed on short girder spans resting on concrete abutments. Waterways are never carried through these subways, separate culverts being built for them. There is no grade crossing of the old and new lines. At Applegate the new line passes under the old line, and at Rocklin it passes over it. From Applegate to Rocklin trains will be operated left-handed.

The contractors use Italian, Swedish and some American laborers. Unskilled labor costs from $2.25 to $2.50 a day, and tunnel men get $3.50.

The free haul in scraper work is 200 ft., from center of excavation to center of mass of fill. Beyond this distance the contractor gets an additional amount per yard. Material is handled with scrapers for a maximum distance of about 1,600 ft., dump cars being used for hauls longer than this. The greater part of the timber for the trestles used in making

There is only one double-track tunnel; this is No. 4. Tunnels are all Southern Pacific standard section. Portals are granite. Tunnels are lined with concrete for 50 ft. and the rest is timbered. Timbers and lagging are redwood. On the Utah company's work headings are driven with two drifts at the springing lines. The bench is taken out by trapping. A drift is driven in the center at grade line and roofed with loose timbers. The bench is blasted out above this and the muck dropped down into dump cars in the drift through openings made by removing the roof timbers.

Of the 17 tunnels on the line, nine are east of Clipper Gap. (A cut has been substituted for tunnel No. 8, and tunnel No. 4½ replaces a cut near Auburn). Nos. 12 to 17 are driven from both ends. No. 17 is 760 ft. long; it was driven through hard slate with a ledge of quartz, in five months. No. 16 is 435 ft. long, through hard slate, and was also holed in five months. No. 15 is 771 ft. long, and was holed in six months. The rock is black quartzite. It is easily broken up, but is hard on drills. These three tunnels are now nearly all timbered and the concrete lining and the portals are being put in. No. 14 is through soft clay shale and slate; it is 1,000 ft. long and has just been holed after nine months' work. No. 13 is the longest on the line, being 3,200 ft. The material is clay shale at each end, with slate in the center, and there is now (Janu-

ary) about 400 ft. yet to do, after 15 months' work. A power plant was built by the contractor to supply air to the drills, power for electric lights, for pumps, and for ventilation. Smoke hangs badly in this tunnel. A suction pipe is carried clear up to the heading. After a shot, air is turned on from a valve in the pipe leading to the drills and the suction fan is started. This clears the tunnel very slowly. It is believed that better results would be obtained by having the suction pipe reach only to a point 400 ft. from the heading, which is about as far back as the smoke gets, letting the compressed air in close to the heading, or perhaps omit the suction and blow the smoke all the way back. An ammonia cartridge is being tried with the dynamite. The ammonia fumes neutralize those of the nitro-glycerine, the amount of ammonia being varied with the amount and strength of the dynamite. The heading is driven in the usual way, described above, except that a small air-operated shovel is used in taking out the bench. The concrete lining is carried in for several hundred feet at each end. Work was started when it was intended to line all tunnels with concrete throughout, so the first part was driven with that expectation. Also, the roof is thin at the west end and there is water in the rock at the east end, making more than the usual length of lining desirable.

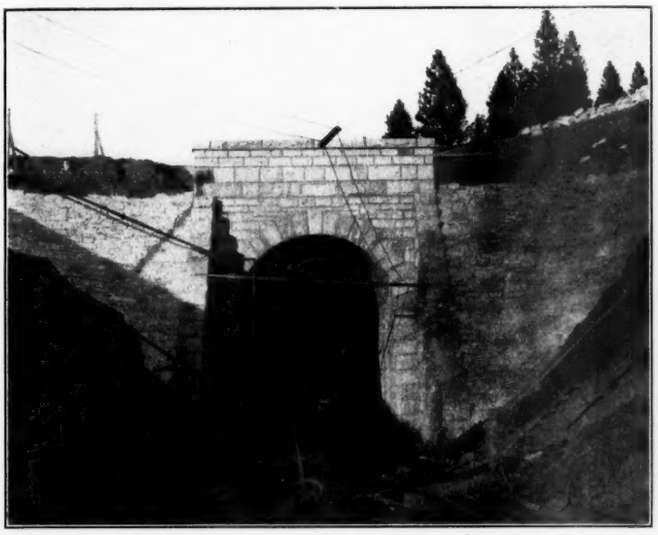


Fig. 5—West Portal of Tunnel No. 13.

Fig. 7—Side-Hill Cutting by Trap Method.

Tunnel No. 12 is 846 ft. long, through shale, limestone and

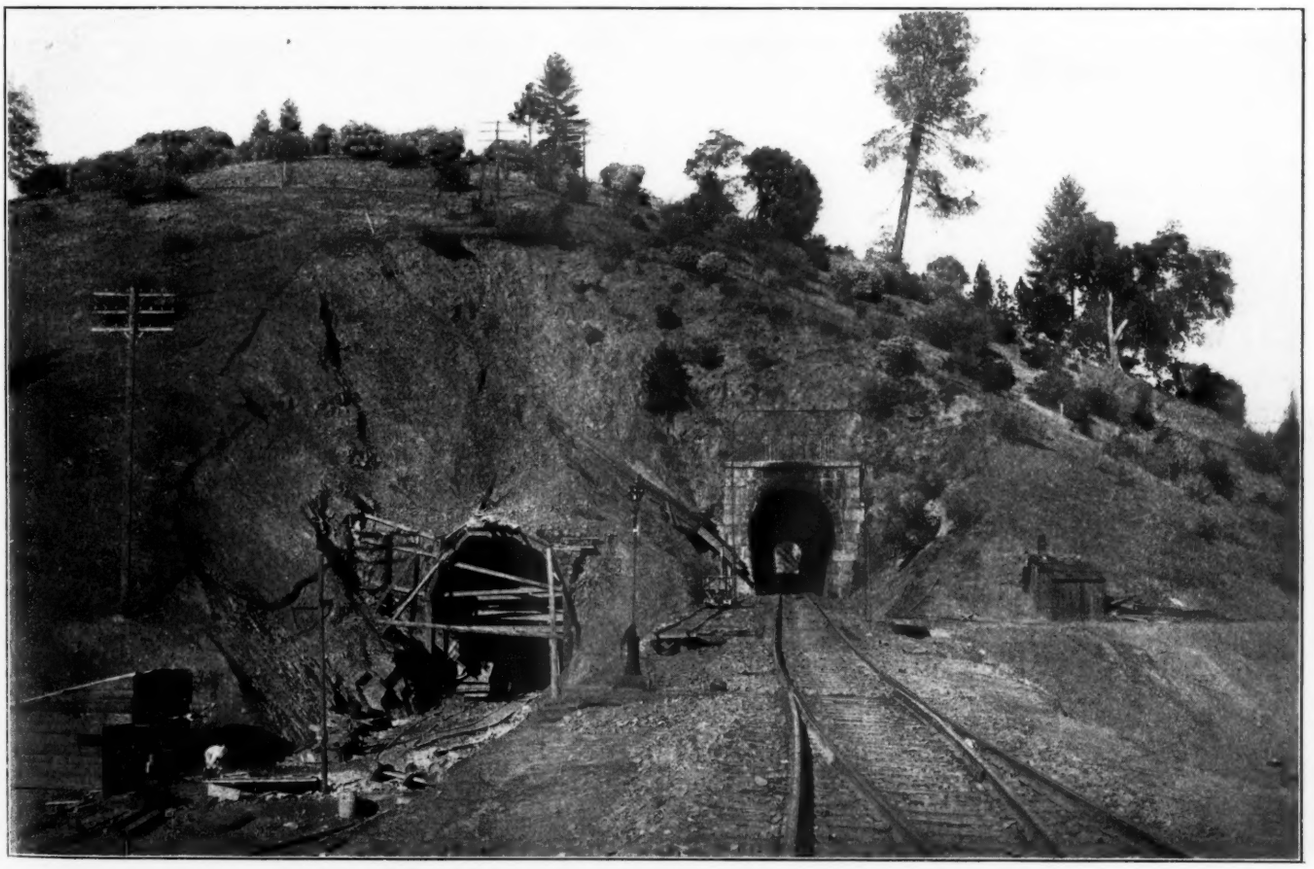


Fig. 6—West Portal of Tunnel No. 9 Before Slide.

Illustrating the danger of building a new tunnel adjoining an operated track.

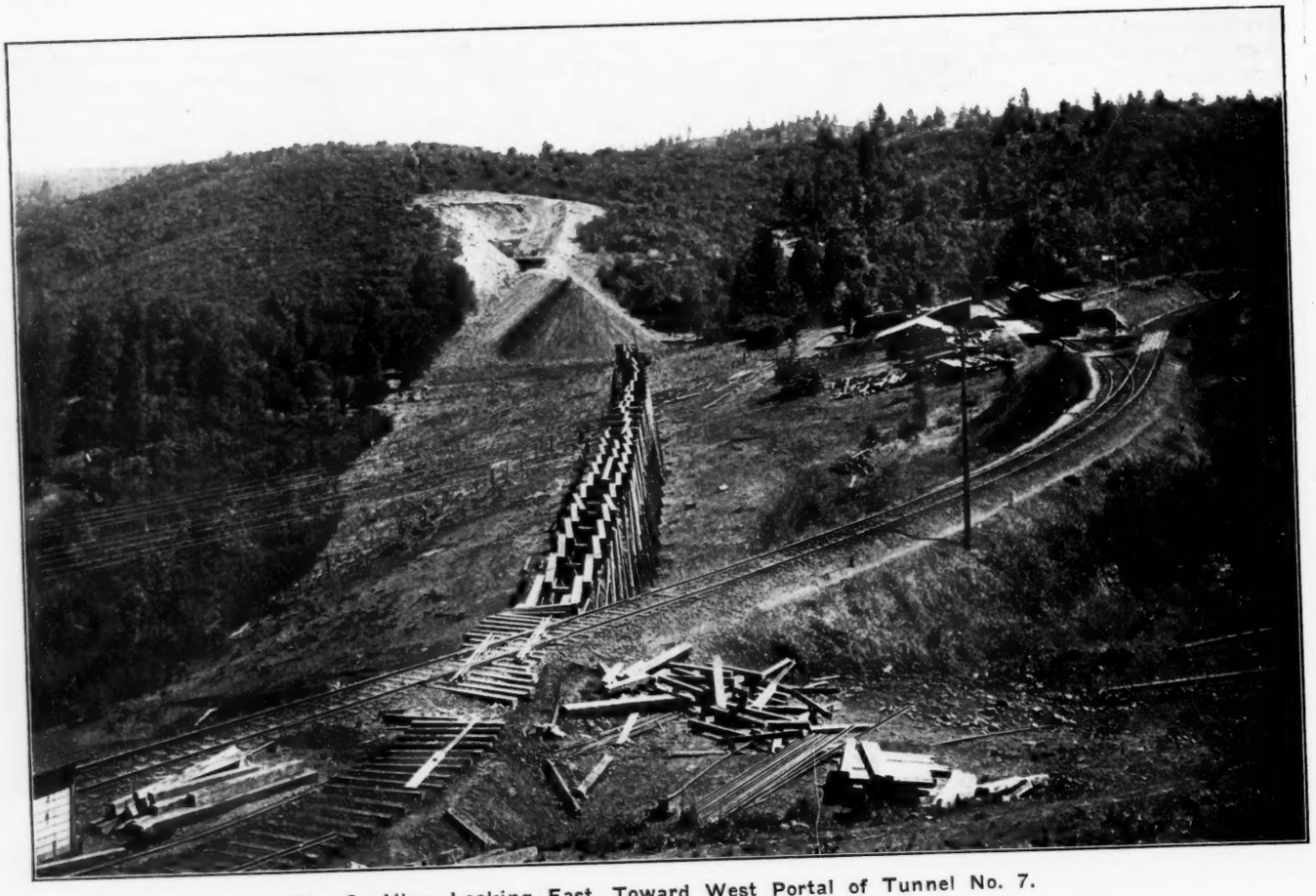


Fig. 8—View Looking East, Toward West Portal of Tunnel No. 7.

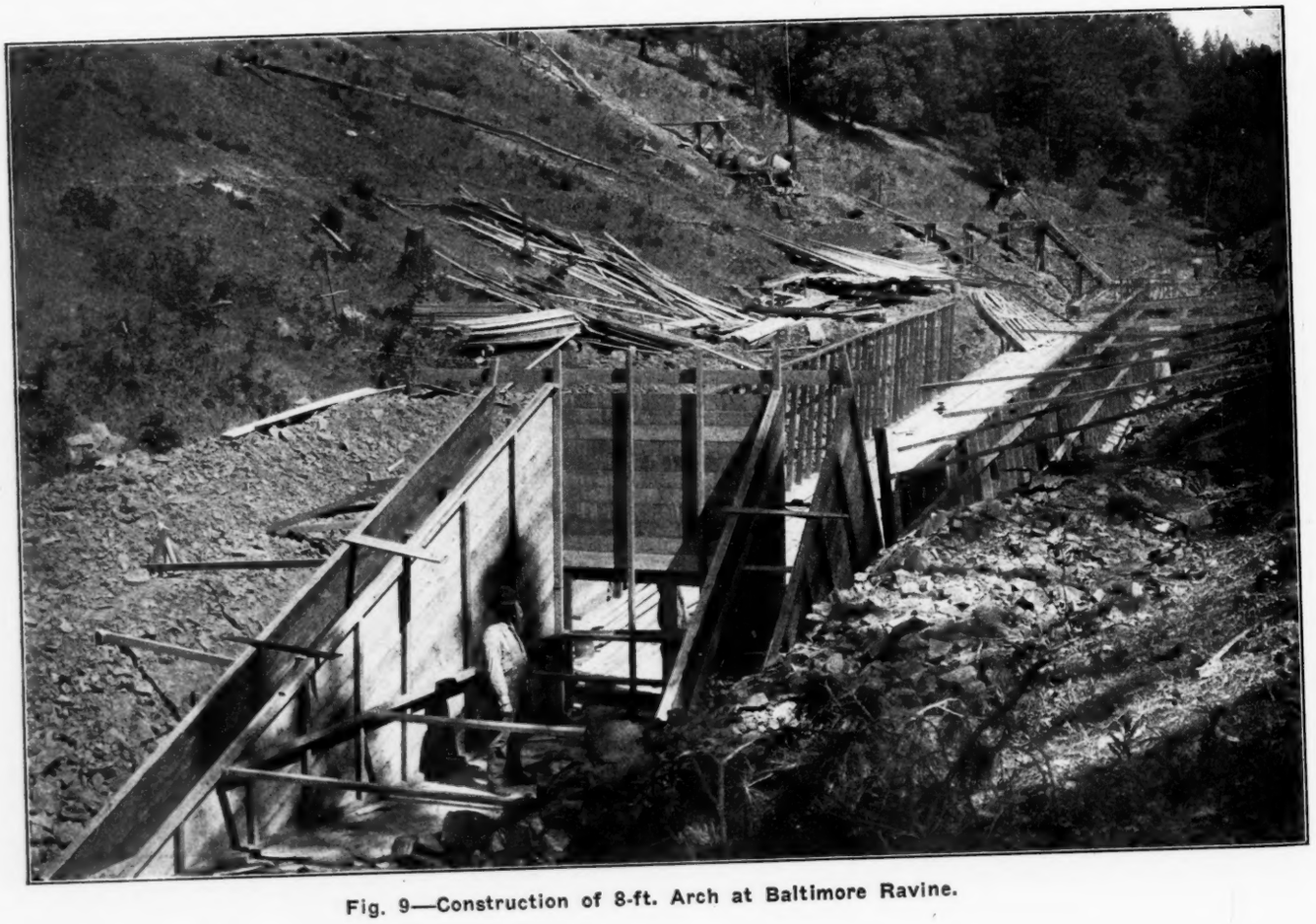


Fig. 9—Construction of 8-ft. Arch at Baltimore Ravine.

some serpentine. After five months' work about 150 ft. remains to be driven.

Near the east portal of tunnel No. 11, at Applegate, the old line is on an embankment and the new line goes through it on a skew in a concrete subway with granite portals, the base of rail being about 30 ft. below base of rail of the old line. This was built with the cut-and-cover method, the old line being temporarily carried on a pile trestle. Where the piles were in the way of the arch and walls of the subway they were boxed and the concrete placed around them, the holes being filled with concrete after the piles were withdrawn. The roof of the subway, over the arch, is reinforced with I-beams, at

Fig. 10—West End of Tunnel No. 3, Showing Granite Boulders and Disintegrated Granite.

right angles to the axis of the new line. The temporary trestle has been filled in and the old track is now on stringers resting on the concrete. The stringers will be replaced with ballast. Tunnel No. 11 is 763 ft. long, through limestone, and work on it has not been started.

From here to Clipper Gap, two miles, is the most troublesome work on the line. The old line constantly interferes with the new eastbound location. It crosses it a number of times, as in the two miles west from Colfax, but the lines are on different levels, so that it is not a simple double-tracking proposition. As a result the old line has to be swung away from its present location at many places, in order to keep it always south of the new line and avoid another cross-over. This eliminates many sharp curves, but it is expensive. In locating the new line and relocating the old line, allowance was made for 1 to 1 slopes and 18-ft. roadbeds. At places the roadbed is as wide as 24 ft., to allow for material eventually taking more than a 1 to 1 slope. To make two approximately parallel lines, on levels varying from 20 ft. to 30 ft. apart, without disturbing traffic on the present operated line, gave rise to several problems.

Just west of tunnel No. 11 the new line requires a cut so close to the cut through which the present line goes that it could not be excavated without spilling material on the present track. A shoo-fly was therefore built around the south side of this work to carry the old line temporarily. In spite of this, rocks were thrown on the shoo-fly track once when a charge was exploded, due to a fault in the rock formation. This is the only place where a shoo-fly was used. There are several places where the lines are so close together that the work, while not so cramped as in this case, cannot be carried on by steam shovels without running risks of blocking the operated line. At these points excavation is by hand, using the trap method described above in connection with tunnel work. The heading of the drift is kept advanced well ahead of the face of the cut, so that a string of dump cars can be run into it and spotted, one after another, under the trap or opening in the roof timbers. Making a cut in this way is usually not much more expensive than if steam shovels were used; the added cost is certainly less than would be the cost of detouring the operated line on a shoo-fly so as to allow the use of steam shovels. No. 10 is 292 ft. long, through limestone. Working from one end, 90 ft. has been driven in two months.

The west portal of tunnel No. 9 was originally 75 ft. west of the present tunnel on the old line, which it parallels. The wall between the new tunnel and the approach cut to the old tunnel was thin. The soft shale through which this part of the new tunnel was driven got so shaken up by the blasting that it slid and, the new tunnel being only timbered, the concrete lining not yet being in, and the thin wall not giving enough support, about 30 ft. of the tunnel collapsed. The 75 ft. of tunnel was therefore replaced with a side cut and the portal advanced even with the portal of the old tunnel.

At Clipper Gap the new line cuts across the old line, forming a chord to the present sharp curve on which the old line rounds the shoulder of a hill. This shoulder has been cut away so as to keep the old line south of the new line and also make a flatter curve. This required a deep side hill cut 120 ft. wide at the bottom. The material was clay shale and it took four months to remove the total 72,000 cu. yds.

Erickson & Petterson, San Francisco, Cal., have the general contract from Clipper Gap to Rocklin, 20 miles. Tunnel No. 7 is 1,024 ft. long, through black quartzite, and 325 ft. of it has been driven in seven months, working from one end only. These contractors usually drive tunnels with only one drift above. This is centered and from it the arch of the tunnel is widened to full section, down to about the springing line. One or two drifts are driven at the grade line and the greater part of the bench is blown down directly into cars in drifts.

Just west of Bowman is a situation somewhat like that at Clipper Gap. Here, however, the old line was moved so far south that separate cuts were made for the old and new lines, the level of the latter being 25 ft. below that of the

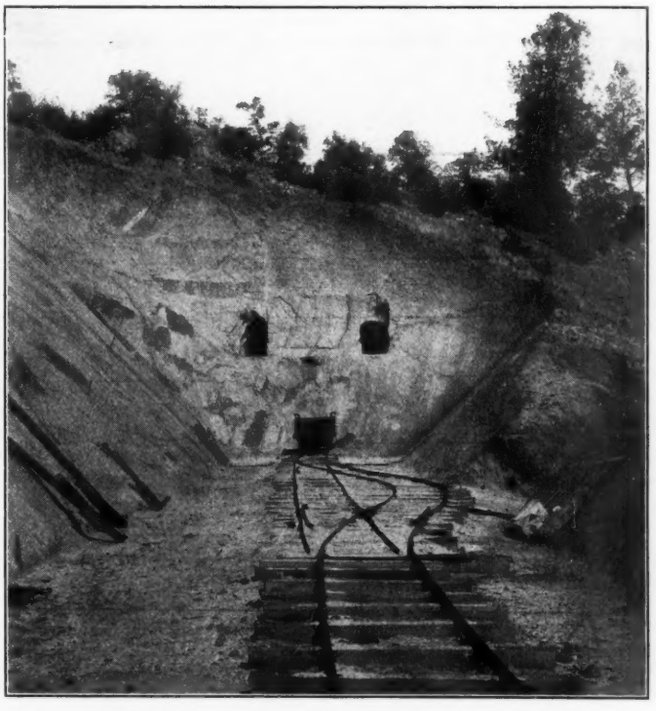


Fig. 11—West End of Tunnel No. 1, Showing Soft Granite.

former. The cut for the new line is 3,500 ft. long, 45 ft. maximum depth, and the 199,000 cu. yds. of excavation was completed in seven months. The relocation and straightening of the old line required a cutting of 40,000 cu. yds.

The heaviest cut between Bowman and tunnel No. 6 is 2,400 ft. long, 35 ft. maximum depth, and containing 103,000 cu. yds., which was excavated in six months. The material was shale and serpentine. Steam drills were used. Tunnel No. 6 will be 1,200 ft. long, through serpentine. It will be driven from one end only; no work has been done yet because of difficulty in getting right of way, but these negotiations have just been completed.

Auburn ravine will be crossed by a 540-ft. trestle, 90 ft. above the stream, on a 3-deg. curve. There are six 60-ft. deck-girder spans, the five steel towers carrying 30-ft. girders. The towers are supported on concrete pedestals. There is a 1,200-ft. cut east of the bridge, and tunnel No. 5 is just west of it. This tunnel will be 1,239 ft. long and will be driven from one end only. Serpentine and a still harder rock, almost like a flint, will be encountered, but work has not yet started. West of this tunnel there is a short fill, then a cut, and then a 600-ft. fill, 120 ft. deep, across Baltimore ravine. The building of the 380-ft. culvert at the bottom of this fill is shown in the photograph. This will require 183,000 cu. yds. Work has been under way for seven months, but has been slow because of the lack of material. Tunnel No. 4½, just west of the fill, has only a few feet to go. When it is through a steam shovel will start work on cuts west of it and the material will be hauled back to the ravine. The fill is being made with a track carried on cables stretched across the ravine. It is a crude arrangement, no towers being used, but the cables being simply anchored to posts and ties bolted directly to them. This makes such a steep slope that at the outer ends of the fill (work is proceeding from both ends) the cables are supported on cribwork to get a level track, and a bumping post is built on top. When the fill is up to grade at the cribwork dumping has to stop until the bumping post and cribwork is moved further out. This has not, so far, delayed the work, since, as noted above, the material has been delivered so slowly, the rock cutting to the east and the tunnel to the west being the only sources of supply. Probably towers will be put up under the cables and a level track hung from them, so that the work will be faster and safer. Towers are being erected at a fill near Newcastle, the only other place where this cable system is

Fig. 12—View at Newcastle, Looking East, Before Work Was Started.

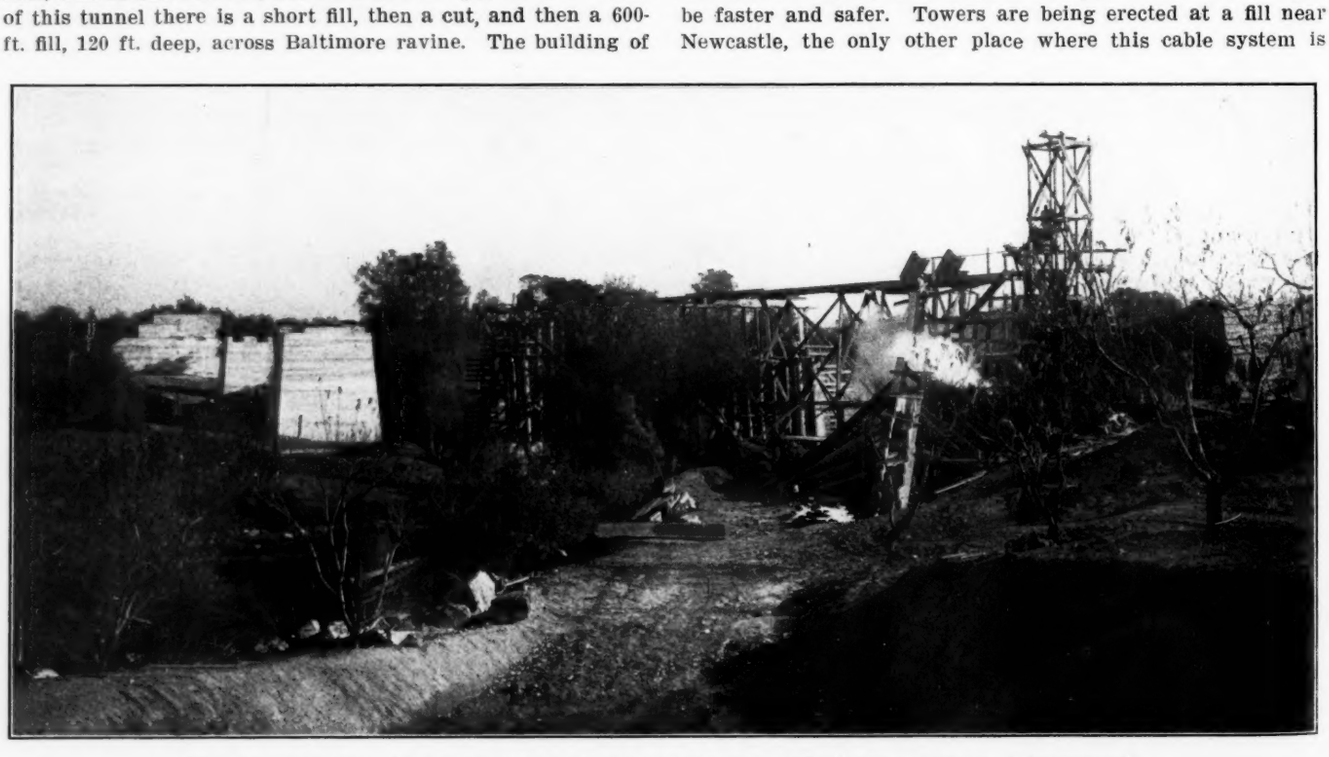


Fig. 13—Antelope Creek Crossing; Grade of Relocated Westbound Line in Foreground.

used. Tunnel No. 4½ is 368 ft. long, through black quartzite, and is nearly through, as mentioned above, after five months' work from one end only. The cuts and fills from here west are not balanced, and a great deal of material has to be borrowed. The biggest fill requires 190,000 cu. yds.

The two lines come together again near Newcastle. The new line approaches tunnel No. 4 on a 2,500-ft. fill, 70 ft. high, maximum, and containing 225,000 cu. yds. Much of this is being borrowed with scrapers. The old line is now on a higher level, but it will be carried down to the grade of the new line and pass through tunnel No. 4, which is double track. As the present operated line lies north of the tunnel, a temporary crossing is necessary. The operated line is carried across on a pile trestle, erected under traffic as at Applegate. Driving each pile took about 45 minutes, and it was hard to get this time between trains. The time includes the time of getting the piledriver down from the spur near the block station at Newcastle, no work train, of course, being allowed on the main line without a train staff. Tunnel No. 4 will be 991 ft. long, through clay shale, with some hard granite boulders. An air shovel is about to be put in here. Because of the width of this tunnel and the character of the ground, the roof is temporarily supported with curved I-beams while putting in the timbering. Work has been under way for one month. From the west portal of the tunnel to Newcastle station there will be a double-track fill 1,000 ft. long and 65 ft. high, requiring 112,000 cu. yds. This fill will be made single track at first. When this is done and the tunnel completed the operated line will be swung over on it and the additional material necessary to make it double track will be borrowed from the old embankment, probably by scrapers. The accompanying photograph, taken last spring, shows this old embankment. The west portal of the tunnel will be near the water tank in the distance.

West from Newcastle the new line diverges to the north, and there will also be about two miles of relocation of the westbound line, eliminating some curvature and keeping it south of the eastbound line. The only other relocation of any account is at Rocklin, as described below. The work on the eastbound line is heavy for about seven miles west from Newcastle. It is a succession of cuts and fills, the heaviest cut being 70 ft. deep, 84,000 cu. yds., and the heaviest fill, 2,000 ft. long, requiring 157,000 cu. yds. Borrowing is necessary for most of the way. The ground is mostly a soft granite, which is disintegrated to a sort of coarse sand for usually 6 to 8 ft. on top. Some of this disintegrated granite is fairly hard, so usually it is all shot before being handled by the steam shovels.

Tunnel No. 3 is 1,639 ft. long, and after five months' work, from one end only, 1,300 ft. remains to be driven. Hard granite was encountered at about the springing line of the arch, but the rest of it is soft granite. No. 2 will be 769 ft. long, through soft granite and conglomerate; work has not yet begun. No. 1 is through about the same material as No. 2. Of the total 1,896 ft., about 900 ft. has been driven in seven months.

At Rocklin the new line would cross the old line at grade. To get a separate crossing the westbound line is being relocated to the north, passing under the new Antelope creek bridge. This relocated line is 6,000 ft. long, on a 6-deg. curve, all within the Rocklin yard limits, the land being fairly level. The grade for it is shown in the foreground in the photograph of Antelope creek bridge. This bridge consists of one 60-ft through girder span over the relocated line, three 60-ft. deck girder spans, and one 125-ft. through riveted truss over the stream. The steel work rests on concrete piers, about 30 ft. high.

The following tables show the average amount of equipment and number of men used each day.

EQUIPMENT AND MEN USED PER DAY BY ERICKSON & PETTERSON.

Grading Force.

Foreman	40.0	Craneman	8.0
Laborers	332.0	Fireman	8.0
Drillers	115.0	Pitmen	34.0
2-horse team and driver	25.0	Watchman	10.0
4-horse team and driver	4.0	1-horse carts and driver	12.0
6-horse team and driver	1.0	Car repairer	2.0
Horses	4.0	Dinkey:	
Dump cars	61.0	Dinkey	8.0
Plows:		Engineer	8.0
4-horse plow, holder & T.	4.0	Brakeman	8.0
6-horse plow, holder & T.	4.0	Blacksmith	4.0
8-horse plow, holder & T.	2.0	Blacksmith helper	4.0
2-horse scraper and driver	24.0	Powderman	5.0
4-horse fresno and driver	18.5	Drills:	
2-horse slip and driver	2.0	Drills	4.0
2-horse fresno and driver	4.0	Drillers	4.0
3-horse snatch and driver	4.0	Helpers	4.0
Steamshovel:		Boilers	4.0
Shovel	8.0	Fireman	4.0
Engineer	8.0		

General Force.

Timekeeper	10.0	Machinist	3.0
Cook	18.0	Watchman	3.0
Waiters	35.0	Driving horses	3.0
Blacksmith	17.0	2-horse supply team	7.0
Blacksmith helper	12.0	4-horse supply team	6.0
Carpenter	6.0	6-horse supply team	1.0
Carpenter helper	6.0	Camp boss	5.0
Saddle horse	6.0	Labor	26.0
Saddle horse	5.0	Clerks	6.0
Foreman	7.0		

Tunnel Force.

Foreman	15.5	6-horse team and driver	3.5
Headingmen	78.0	Drills:	
Breastmen	26.0	Drills	4.0
Laborers	184.0	Drillers	11.0
Cornermen	8.0	Drillers' helper	8.0
Benchmen	12.0	Unloading and hauling lumber:	
Boiler	2.0	Labor	12.0
Boiler fireman	2.0	2-horse team and driver	3.0
Carpenter	4.0	4-horse team and driver	3.0
Carpenter helper	2.0	Dump:	
Blacksmith	10.0	Cars	30.0
Blacksmith helper	9.0	Horses	20.0
Dumpmen	5.0	Drivers	2.0
4-horse team and driver	1.0	1-horse cart	2.0

Masonry Force.

Foreman	14.0	Carpenter helper	8.0
Mixers	39.0	2-horse team and driver	8.0
Tampers	17.0	4-horse team and driver	30.0
Labor	94.0	Mixer	5.0
Carpenter	19.0	Engineer	5.0

EQUIPMENT AND MEN USED PER DAY BY UTAH CONSTRUCTION CO.

Grading Force.

Foreman	20.0	Watchman	4.0
Laborers	213.0	Dinkey:	
2-horse team and driver	2.0	Locomotives	8.0
4-horse team and driver	2.0	Engineers	8.0
6-horse team and driver	1.0	Brakeman	8.0
Drillers	29.0	Carpenters	3.0
Dump:		Carpenters' helper	5.0
Dump cars	73.0	Powderman	3.0
Horses	12.0	2-horse scraper and driver	4.0
Drivers	8.0	4-horse fresno and driver	6.0
Steamshovels:		4-horse plow, holder and T.	9.0
Steamshovel	4.0	6-horse plow, holder and T.	3.0
Engineer	4.0	Hoist engine	1.0
Craneman	4.0	Hoist engineer	1.0
Fireman	4.0	Signalman	1.0
Pitmen	15.0		

General Force.

Foreman	10.0	2-horse supply team	7.0
Timekeepers	8.0	4-horse supply team	5.0
Cooks	14.0	6-horse supply team	1.0
Waiters	23.0	Clerks	3.0
Blacksmith	2.0	Camp boss	1.0
Blacksmith helper	2.0	Laborers	11.0
Carpenters	2.0	Machinist	2.0
Carpenters' helper	1.0	Corral boss	3.0

Tunnel Force.

Foreman	14.0	Drillers	32.0
Headingmen	24.0	Drillers' helpers	8.0
Breastmen	14.0	Unloading and hauling lumber:	
Laborers	82.0	Foreman	2.0
Pumps	3.0	Labor	12.0
Compresor	2.0	2-horse team and driver	1.0
Compressorman	2.0	4-horse team and driver	5.0
Electrician	1.0	Dump:	
Fireman	1.0	Cars (dump)	31.0
Boilers	2.0	Horses	7.0
Sawmill	1.0	Drivers	7.0
Sawmill operator	1.0	Shovel:	
Sawmill laborer	2.0	Steamshovel	1.0
Carpenters	6.0	Engineer	1.0
Carpenters' helpers	2.0	Craneman	1.0
Blacksmith	6.0	Dinkey:	
Blacksmith helper	2.0	Locomotives	2.0
Fans	1.0	Brakeman	2.0
Drills:		Engineer	2.0
Drills	8.0	Hoists	4.0

Masonry Force.

Foreman	4.0	Carpenters' Helper	6.0
Mixers	15.0	4-horse team and driver	6.0
Tampers	5.0	2-horse team and driver	3.0
Hod carriers	6.0	Mixer	1.0
Laborers	30.0	Gasolene engine	1.0
Carpenters	4.0	Engineman	1.0

The work is now about 40 per cent. finished. No rails have been laid.

We are indebted for material for the above description to William Hood, chief engineer; A. J. Barclay, assistant engineer, who is in charge of the work, and J. C. Christy, engineer in charge of right of way purchases.

TRAIN ACCIDENTS IN JANUARY.[1]

Following is a list of the most notable train accidents that occurred on the railways of the United States in the month of January, 1910. This record is intended to include usually only those accidents which result in fatal injury to a passenger or an employee or which are of special interest to operating officers. It is based on accounts published in local daily newspapers, except in the case of accidents of such magnitude that it seems proper to write to the railway manager for details or for confirmation:

Collisions

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	No. persons reported Kil'd.	Inj'd.
1.	Great Northern.	Oxford, Mont.	rc.	P. & Ft.	2	20
1.	C., B. & Q.	Judith Gap.	bc.	P. & Ft.	3	3
2.	Bost. & M.	Charlestown.	rc.	Ft. & Ft.	1	1
3.	C., M. & St.P.	Roscoe, S.D.	bc.	Ft. & Ft.	6	2
5.	Balt. & Ohio.	W. Alexandria.	bc.	P. & Ft.	2	3
†5.	Ore. R.R. & N.	Cascade Locks	rc.	Ft. & Ft.	2	5
6.	Lehigh & H.	Woodruffs Gap	bc.	Ft. & Ft.	1	3
7.	L. S. & M. S.	Harbor Creek.	....	P. & Ft.	1	2
†9.	Texas & Pac.	Shreveport.	bc.	P. & Ft.	5	0
12.	Ore. Sh. Line.	Arcadia.	rc.	P. & Ft.	1	3
†16.	C., M. & St. P.	Keystone.	bc	P. & P.	2	9
16.	Ill. Central	Pinckneyville.	rc.	P. & Ft.	1	10
17.	Southern Pac	Lemay.	xc.	P. & Ft.	3	3
17.	Denver & R. G.	Leadville.	bc.	Ft. & Ft.	2	3
23.	Mobile & Ohio.	Carroll, Tenn.	bc.	P. & Ft.	2	2
29.	L. S & M. S.	Ashtabula.	rc.	P. & P.	0	3
31.	L. S. & M. S.	Swanton, O.	rc.	P. & Ft.	1	2

Derailments.

Date.	Road.	Place.	Cause of derlmt.	Kind of train.	No. persons reported Kil'd.	Inj'd.
15.	Colo. Mid.	Leadville.	unx.	Ft.	4	3
18.	Northern Pac.	Blue Grass.	b. rail.	Pass.	0	4
19.	T., St. L. & W.	Panama.	unx.	Ft.	3	0
20.	Den., N.W. & P.	Antelope.	runaway.	Ft.	3	2
22.	C.,C.,C. & St. L.	Riverside.	eq.	Pass.	5	15
25.	N. Y. Central.	St. Johnsville.	neg.	Pass.	2	0
25.	Denver & R. G.	La Veta.	boiler.	Ft.	2	3
27.	Penn.	Titusville.	unx.	Ft.	4	2
27.	Caro., C. & O.	St. Paul, Va.	acc. obst.	Ft.	4	3
31.	Texas & Pac.	Jefferson.	b. rail.	Pass.	0	6

The butting collision near Roscoe, S. D., on the third, was between two trains, neither of which had the right of way, one being a freight and the other a work train. Three Bulgarian workmen were killed and 8 others were injured. The crew of the work train were engaged in clearing the track of snow. The freight was running at 15 miles an hour at the moment of the collision, and the engine of the work train was overturned. The collision was due to misunderstanding of orders on the part of the work train.

The conductor and engineman responsible for the collision at Woodruff's Gap, N. J., on the sixth were arrested and tried on a charge of manslaughter, but were acquitted. A brief account of the trial was given in the *Railway Age Gazette* of February 11, page 321. The case is of interest as being one in which lack of sleep was presented as a reason for the negligence of the men, while yet there had been no violation of the hours of labor law and apparently no intentional misuse of time on the part of the negligent engineman.

The collision at North East, Pa., on the seventh resulted in the killing of three and the injuring of 10 employees on a work train. Westbound passenger train No. 23 collided with this work train, badly damaging two of its cars. The work train was occupying the main line while the men of the crew were engaged in repairing telegraph and signal wires which had broken down in the severe sleet storm of January 5. The passenger train had run past an automatic block signal which was set against it.

The collision at Shreveport, La., on the ninth occurred on a yard track. A Texas & Pacific passenger train, No. 53, was moving backward toward the station and was met by a switching engine of the Kansas City Southern, and the leading car of the passenger train, a sleeping car, was wrecked for fully half of its length. The conductor and one passenger standing on the rear platform of this car—that is to say, on the leading end of the train—were killed, as was a trainman on the switching engine, and two other passengers were slightly injured.

In the rear collision at Ashtabula, Ohio, on the twenty-ninth, in daylight, the westbound Lake Shore Limited, which had stopped for the purpose of taking on a dining car, was run into at the rear by the following Boston & St. Louis express, and the observation car of the limited, the rear half of which was empty, was wrecked. Four sleeping cars next ahead of this were knocked off the track. Only one passenger was seriously injured, but the total number of injuries reported was: passengers 56, employees 13, other persons 14. The St. Louis express had run past distant and home automatic signals set against it.

The derailment near Leadville, Col., on the fifteenth is reported as due to the train becoming uncontrollable on a steep grade, a cause which is very familiar in the railway history of Colorado; but an officer of the road is quoted as saying that the cause was a broken rail.

The train derailed at St. Johnsville, N. Y., on the twenty-fifth was the eastbound Twentieth Century Limited express, and the engineman and fireman were killed. It occurred at 5.40 a. m. In consequence of the presence of a slower train east of St. Johnsville the signalman at that point set his switches to turn the express from track No. 1 to track No. 4, the eastbound freight track, intending to have the train run on that track to the next station; and the derailment was caused by excessive speed through the three crossover tracks. The engine was not derailed until it reached the third or last crossover, but then it was quickly overturned, and the engineman and fireman were crushed to death beneath it. Three of the cars of the train were derailed, but they were not badly damaged, nearly all of the windows remaining unbroken. As the distant signal is 3,500 ft. west of the home signal, and its light was clearly visible, being obscured by nothing except that a very light snow was falling, there is no explanation of how the engineman came to enter the crossovers at such high speed. The engineman, 35 years old, is said to have been one of the best on the division.

The train derailed near Titusville, Pa., on the twenty-seventh had one engine at the front and two at the rear, and the immediate cause of the derailment is said to have been some trouble at a switch, which ditched the leading engine; but the disastrous character of the accident is attributed to the fact that the two engines at the rear continued pushing for some seconds after the leading engine ran off the track, this overturning that engine and pushing it into a bank at the side of the road. The four men killed and the two injured were all on this leading engine.

The train derailed at Jefferson, Tex., on the thirty-first was the second section of southbound passenger train No. 3, and the wreck accurred about 4 a. m. Five passenger cars were overturned and ditched, but they were not badly wrecked, and it is said that none of the personal injuries were of a dangerous character.

The train derailed at St. Paul, Va., on the twenty-seventh was a work train moving backward. It ran into a rock which had fallen on the track. The collisions on the Boston & Maine on the second and on the Southern Pacific on the seventeenth were due to misplaced switches, and that on the Denver & Rio Grande on the seventeenth to a mistake in orders. The three persons killed in the derailment at Panama, Ill., on the nineteenth were trespassers, smothered to death in a car of grain.

Of the 11 accidents to electric cars reported in the newspapers as occurring in the United States in the month of January two were butting collisions on interurban roads, one of which is reported as causing two fatal injuries. One rear collision in New York City caused one fatal and three non-fatal injuries.

[1] Abbreviations and marks used in Accident List:
rc, Rear collision——bc, Butting collision——xc, other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, unexplained——derail, open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc.——boiler, Explosion of boiler of locomotive on road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Ft., Freight train (includes empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

THE ELECTRIFICATION OF TRUNK LINES.

BY L. B. POMEROY.*

It is assumed from a physical and mechanical viewpoint that electric traction can meet all the demands and requirements of railway service. Therefore, whether electricity will replace steam traction or not is entirely a commercial problem.

It may be stated at the outset that whatever system of electrification is adopted a very large outlay has to be faced, and no case for electrification can be made out unless an increase in net receipts can be secured sufficient to more than pay interest on the extra capital involved. This increase may be brought about either by decreasing the working expenses for the same service, by so modifying the service as to bring in a greater revenue, or by a combination of these.

However, there is hardly a steam road in existence to-day which does not have divisions or sections, where distinctly local traffic can be handled more profitably by light, comparatively frequent electric service, than as now, with heavy steam trains. Both steam and electric service can be operated over the same tracks without detriment or embarrassment to either. In so doing each kind of service would be appropriately handled in a manner best suited to the conditions of each.

The fundamental principle, based on the present state of the art, seems to be that if you cannot accomplish something by means of electricity that is now possible by steam traction, there is nothing to justify the change; the mere substitution of one kind of power for another merely to obtain the same result is not commercially warranted.

There are certain inherent advantages in electrical operation that have shown up very well, because the increase in business has absorbed the increased interest account, but these cases hardly apply to trunk line conditions, as the law of induced travel has no bearing on freight train operation, the principal business of trunk line roads.

In heavy work the limiting feature of the steam locomotive is the boiler, and the maximum adhesion can be utilized only at low speeds. For example, a 2-8-0 locomotive with 180,000 lbs. on the drivers has a tractive force, at 10 miles per hour, of about 40,000 lbs., or 4.5 to 1. At 30 miles per hour the tractive force becomes 13,250 lbs., or 30.2 to 1. As tractive force governs the tonnage hauled, the ability of the electric locomotive to utilize almost indefinitely power proportional to the maximum adhesion and produce a drawbar pull entirely independent of the critical speed of a steam locomotive, as limited by the boiler, is a marked feature.

In heavy grade work the ability to increase the speed shows up favorably to the electric locomotive as enlarging the capacity of a given section, but here also the business has to be sufficient to absorb the increase in fixed charges.

With steam locomotives a coal consumption, when running, of 4 to 5 lbs. per i.h.p. hour really means 6 or 7 lbs. at the rail, when the losses due to firing up, laying by in yards and sidings, blowing off at the pops and consumption of the air pumps are taken into account. Whereas, under electric operation, with an efficiency of 65 to 70 per cent. between the power house and the rail, a coal consumption of 4 lbs. per kilowatt hour at the rail can be counted on.

The writer is informed that the Metropolitan Street Railway station (1903), with a 40 per cent. load factor, produced power at the switchboard at the rate of 4.7 mills per kilowatt hour (or 3.5 mills per h.p. hour), and with a load factor of 55 per cent., which prevails in the winter time, the cost is at the rate of 4.43 and 3.3 mills, respectively. These costs cover all expenses and repairs except fixed charges. The coal consumption is 2.9 lbs. per kilowatt and 2.16 per h.p. hour.

L. B. Stillwell is authority for the statement that the Interborough is producing power at the rate of 2.6 lbs. of coal per kilowatt hour, or 3 lbs. at the drawbar.

Another authority gives the following figures for the elevated roads for cost of power, $0.005 per kilowatt hour at the switchboard, $0.0066 at the third rail shoes, or $0.0089 at the rims of the drivers. These figures are exceptional and hard to duplicate, and as the fixed charges are not included the writer would consider 1¼ cents per kilowatt hour at the rail a conservative figure, and will use this cost in the following computations.

RELATIVE COST OF COAL FOR STEAM AND ELECTRIC OPERATION.

It may be fair to assume that where average coal is used we can count on about $2.25 per ton for locomotive coal on the tender, while a much cheaper grade can be used in the power house, costing, with modern coal handling facilities, about $1.50 per ton. At this rate the relative difference in the cost of the coal at the rail would be represented by the following figures:

Electric power station $\frac{\text{2.5 lbs.}}{\text{50 per cent. off}}$ x $1.50 . . .	$7.50
Steam locomotives 7 x $2.25	15.75

or 50 per cent. in favor of electricity. The following results of the Mersey Tunnel operation are pertinent: Under electric operation one ton of coal at $2.10 yields 2.29 ton-miles at 22½ miles per hour, while with steam one ton of coal at $3.84 yields 2.21 ton-miles at 17¾ miles per hour. The difference, amounting to 55 per cent., is in favor of the electric operation.

On mountain grades or in heavy freight service, where the boiler of the freight locomotive is forced to the limit and the boilers are designed for this particular purpose, the showing is still more favorable to the electric side. Especially is this true when the steam locomotive is detained on side tracks for as long a period as it takes to make the run, which is very frequently the case, since under these conditions the cost for fuel becomes a larger proportion of the total operating expense. A 2-8-0 locomotive with 50 sq. ft. of grate surface burns 300 lbs. of coal per hour while lying on side tracks. Reports from Mallet locomotives indicate that from 600 to 800 lbs. are burned per hour under the same conditions.

The cost of a unit of power with the steam locomotive becomes relatively higher under maximum than minimum boiler demands, while with electricity the cost per unit is at a uniform rate, whether working under extreme or light power demands.

An express passenger locomotive of the Atlantic (4-4-2) type, with the following data: Cylinders, 21 by 26 in.; boiler pressure, 200 lbs. per sq. in.; weight on drivers, 102,000 lbs.; heating surface, 2,821 sq. ft.; grate surface, 50 sq. ft.; rate of combustion, 150 lbs. per sq. ft. of grate surface per hour; speed, 70 miles per hour.

$$\frac{7{,}500 \times 2.85 \times 20 \times 1{,}000}{2{,}000 \times 70 \times 80\% \times 5{,}350} = \$0.71$$

Under electric conditions we have

$$\frac{20 \times 2 \times \$0.01\tfrac{1}{4} \times 1{,}000 \text{ tons}}{1{,}000 \text{ watts}} = \$0.50$$

or 28½ per cent. less.

These figures apply only to average conditions on an undulating profile, when coasting is occasionally possible. With the benefits of momentum grades, also, the figures would be relatively less, but the electric locomotive would respond and benefit accordingly, so that the percentages would be approximately the same.

When steam locomotives are loaded to their capacity, as is generally the case where tonnage rating is practised, the rate of combustion of 150 lbs. of coal per square foot of grate surface per hour will still hold good and remain constant, the tons hauled being the variable, responding or being modified by the speed or physical conditions of the road.

SAVINGS CLAIMED FOR ELECTRIFICATION.

In view of the foregoing the following extract from an article by C. L. De Muralt will be of interest. The figures are

*Abstract of an address before the Engineering Society of Columbia University.

from the annual report of 1903 of the roads named:

Cost of Operating Trunk Lines.

	Penn. R.R.	N. Y. Cent.
Fuel for locomotives	$6,000,135	$4,635,877
Water for locomotives	335,286	295,583
Other supplies for locomotives	382,548	334,673
Wages: Enginemen and roundhouse men	5,716,848	4,928,443
Other trainmen	4,442,127	2,991,335
Switchmen, flagmen and watchmen	3,900,427	2,511,552
Other expenses of conducting transportation	14,540,542	11,607,538
Repairs to locomotives	4,412,983	3,608,972
" other equipment	10,674,726	5,661,992
" roadbed	8,542,935	6,145,341
" structures	4,122,018	2,454,691
General expenses	1,858,319	1,786,494
Total	$64,928,894	$46,962,491

Mr. De Muralt then applies the figures found during the course of his investigation, which would lead to the following reductions if electricity was adopted as a motive power:

	Penn. R.R.	N. Y. Cent.
Fuel, 10 per cent.	$600,013	$463,388
Water saved entirely	335,286	295,583
Other supplies, 50 per cent.	191.274	167,336
Wages, enginemen, etc., 25 per cent.	1,429,212	1,207,361
Repairs to locomotives	2,206,492	1,804,486
Total amount saved.	$4,762,277	$3,942,154

The saving in water alone capitalized at 5 per cent. equals $6,750,000 for the former and nearly $6,000,000 for the latter road. As large as these alleged savings are, yet they would not amount to more than 2½ to 3 per cent. on the necessary increase in capital to electrify the roads on which the foregoing savings apply.

While the first cost for power stations and electric equipment represents a large outlay, yet such items as the cost for repairs of locomotives and shops, expensive hostlering at terminals, coaling and water stations, and the incidental labor charge and repairs thereto will, in the aggregate, be materially reduced. The comparative saving in repairs will be indicated by the following figures:

	Per cent.	
Repairs.	Steam.	Electric.
Boiler	20	0
Running gear	20	20
Machinery	30	15
Lagging and painting	12	5
Smokebox	5	0
Tender	13	0
Total	100	40

OTHER COMPARISONS BETWEEN STEAM AND ELECTRIC LOCOMOTIVES.

It is further claimed that, with electric operation, greater mileage is possible with the electric locomotive and that fewer units are necessary to perform the same service. Great stress is laid on the fact that the ordinary freight locomotive makes only 3,000 miles per month, or 100 miles per day, against which is put forward the ability of the electric locomotive to perform practically continuous service, suggesting the propriety of comparing electric and steam operation on the basis of ton-miles per annum each is able to make and also the relative weight on driving wheels and not their total weight.

The operating efficiency of a steam locomotive in freight service is so low, averaging about 3,000 miles per month, that it is generally thought due to limitations, *per se*, in the locomotive, whereas it is mainly due to operating and traffic conditions, which limitations would apply with equal force to the electric locomotives, so that, barring some increase in speed, the electric locomotive can make no greater mileage than its steam competitor in equivalent service, consequently its splendid ability to perform almost continuous service cannot be realized in practice for reasons aforesaid.

The time for which the mechanical department is responsible = 22 per cent.; the average time the locomotive is performing useful work = 28 per cent—i. e., actually pulling trains, 3,000 miles per month, 100 miles per day; while the period or balance of tne time that the locomotive is under steam, with crew, and ready to go, and represents the time at terminal yards, side tracks and awaiting orders, etc. = 50 per cent.

It is just here that our electrical friends make the great mistake of claiming "greater capacity" for the electric locomotive over its steam equivalent. It is conceded that under electric conditions the 22 per cent. may be reduced as much as one-half and perhaps, owing to greater speed, the 28 per cent. may be increased, but the "lost motion" period due to traffic and operating causes will be relatively the same for both. The percentages are from an actual three months' test on a trunk line reported in 1904 in the proceedings of the American Railway Master Mechanics' Association by the committee on time service of locomotives.

The only cases where electric operation is commercially justified is in congested local passenger situations where the conditions closely approach those of a "moving sidewalk" and the records show that these cases have been profitable only when a large increase in business has been realized.

POWER STATION CAPACITY.

The impression is quite prevalent that if 100 steam locomotives are required to operate a certain division, if operated electrically, a power station capacity the equivalent of 100 locomotives would be necessary, whereas the generator capacity, barring the installation of spare units, would be of such size as to meet the average load. This average can be determined by laying down a train sheet, from which the load at any hour in the day can be seen and the peaks located.

For ordinary computations the number of trains to provide for is, approximately:

$$\frac{\text{The total train-miles per hour}}{\text{Mean speed}}$$

Consider the example of a road or division 100 miles long on which a given train requires 2,000 h.p. to keep it in motion. If 20 cars take a maximum of 100 h.p. each, the electrical conductors and distributing apparatus will never be required to deliver more than 100 h.p. at any one point. If, on the other hand, the entire traffic of the line must be concentrated in a single train, the electrical conductors and distributing apparatus must deliver the full 2,000 h.p. at each and every point. In other words, with the concentrated load, the capacity of the distributing apparatus at each and every point must be 20 times as great as the capacity when 20 cars are used to give the same total load. Electric traction has proved its superiority for distributing loads, but concentrated loads are still handled almost exclusively by steam locomotives.

SOME ADVANTAGES OF ELECTRIC LOCOMOTIVES.

With steam locomotives the most economical average speed, for freight service, is 12 to 15 miles per hour, where there is ample track space for the free movement of trains. With a dense traffic this free movement can only be obtained by a higher speed and if the large train tonnage be maintained, more horse-power is required of the engine and boiler. It is difficult to increase the size of steam freight locomotives without resorting to the Mallet compound articulated type, and here we have the equivalent of two locomotives in one machine.

With the electric locomotive it is possible to develop a much greater horse-power and a large percentage of overload at the time when needed and to do it more economically than with steam. The New York Central electric locomotive has a maximum peak horse-power of 3,000, which is 25 per cent. above normal. This maximum is about double the power which can be obtained from the New York Central standard Atlantic (4-4-2) type locomotive. Similar proportions can be obtained for electric freight locomotives and their size and power are not limited by boiler capacity. If the steam locomotive is capable of developing 30,000 T. F. at the drawbar at 12 m.p.h. or

$$\frac{30{,}000 \times 12 \text{ m.p.h.}}{375} = 960 \text{ h.p.}$$

and it is required to increase the speed of the train to 20 m.p.h. and maintain the same tonnage, then 1,600 h.p. will be required, which means the employment of a much larger locomotive or double heading.

The advantage of the overload capacity on short mountain grades or for strategic peaks is one of the strong points in

favor of the electric machine and would make electric operation applicable to special cases rather than a universal substitute, in the broad light of commercial considerations.

GENERAL CONCLUSIONS.

Our conclusion, from this survey of the situation, is that the rapid development of suburban passenger traction by electricity will require large power houses at large cities, and these can gradually be made sufficient for working the line on further stretches in each direction, handling congested terminals, or used where commercially practicable, until it may be desirable to electrify the entire division.

Electric operation as compared with steam shows to greatest advantage in urban and suburban passenger service. Here, if multiple unit trains are employed, so that a considerable fraction of the total weight is carried on the driving wheels, thus permitting a high rate of acceleration to be used, a schedule speed quite impracticable in steam operation can be maintained. Moreover, a more frequent service can be given without a proportional increase in expense, while in times of light traffic small trains can be run, the energy consumption per train in such service being almost in proportion to the number of coaches. The law of induced travel, however, applies to urban and suburban passenger service, but does not hold for trunk lines and especially freight service.

TO DETERMINE WHETHER IMPROVEMENTS ARE JUSTIFIABLE.

Under trunk line conditions the only thing that interests railway managers is the traffic available at the present, relatively speaking; the future is too indefinite to be capitalized to any great degree in advance. It is more in the line of insurance companies to "capitalize expectations."

In grade revision the authorization for expenditure is based on the saving in train-miles capitalized. The following is a concrete case from a western road, or rather the summation of the engineers' report as to just what the proposed rearrangement would amount to. The rate of 50 cents per train-mile is to cover those items of cost directly affected by the change.

$$\left.\begin{matrix}\text{Number of}\\ \text{trains per}\\ \text{day—7}\end{matrix}\right\} \times \left\{1 - \frac{\text{1,350 tons present conditions}}{\text{1,600 tons proposed}}\right\} \times \left\{\begin{matrix}\text{Div. of}\\ 225\\ \text{miles}\end{matrix}\right\} \times 50\text{c.} \times \left\{\begin{matrix}365\\ \text{days}\end{matrix}\right\} = \$45{,}990.$$

Under the circumstances it will be seen that the value of 1 per cent. reduction in train mileage per mile per train, amounts to $1.95 per annum. The total amount capitalized at 5 per cent. equals $919,800. In some such manner the steam railway manager arranges the proposition of the electric scheme and decides accordingly.

SOME EXAMPLES.

In a paper before the American Society of Civil Engineers, by W. J. Wilgus, some interesting data concerning New York Central operation were given:

Cost of coal per 2,000 lbs. anthracite steam loco. terminal service	$4.46
" bituminous coal, road service	3.12
" bituminous coal, power station	2.72
Water per 1,000 gallons—	
Power station	13.5 cts.
Road service	5 "

The cost of current, when power station designed load is attained, is 2.6 cents per kilowatt hour delivered at contact shoes. This includes all operating and maintenance costs, interest on the electrical investment required to produce and deliver current, depreciation, taxes, insurance and transmission losses. The following table summarizes the data:

Items.	Operating costs.	Fixed charges.	Total.
Power station	0.58 cts.	0.44 cts.	1.02 cts.
Transmission losses	0.19 "	0.15 "	0.34 "
Distribution systems substations	0.32 "	0.92 "	1.24 "
Totals	1.09 cts.	1.51 cts.	2.60 cts.

In a discussion by G. R. Henderson (page 102, Vol. LXI, Trans. A. S. C. E.), are given road service costs per 1,000 car ton-miles:

	Steam.	Electric.
Supplies	$2.03	$1.37
Wages	0.28	0.31
Interest, depreciation and repairs to locomotive	0.46	0.34
Total	$2.77	$2.02

The item "Electric Supplies" is composed of operating expenses and fixed charges and may be analyzed thus:

53.3 kw. hour at $0.0109, $0.58 operation.
52.3 " " " 0.0151, 0.79 fixed charges
52.3 " " " 0.026, 1.37

$$\text{[Fixed charges} = \left\{\frac{0.79}{1.37}\right\} = 57 \text{ per cent. of operating expenses.]}$$

The brackets are ours. The difference in cost between steam and electric traction in road service is $2.77 — 2.02 = $0.75 per 1,000 car ton-miles.

The fixed charges on the power plant and the transmission system are $0.79 per 1,000 car ton-miles, or about the same as the saving, so that if the train movement were but one-half the assumed amount (averaging 6,000 horse-power at the rails, or 6,000 kilowatts at the station) the cost for electric service would be slightly higher than for steam, or $2.81 as against $2.77 per 1,000 car ton-miles.

There has just been reported the four years electric operating results of the Mersey tunnel road connecting Liverpool and Birkenhead. The net profit, allowing interest, etc., on the increased capital due to electrification, amounted to 15 per cent., but it took an increase in traffic of 55 per cent. to make this operating result possible. Ton-miles increased from 43 to 67 million, or 55 per cent. Total expenses, including interest on electric capital (but not depreciation) equal $0.586 per ton-mile. Interest equals $0.106 per ton-mile, or 22 per cent. of operating expenses.

President Harahan, of the Illinois Central, reports the results of the investigation that has been made relative to the proposed electrification in the following words:

"Our suburban traffic is the only service which would in any degree be adapted to electric operation, but even in this particular service it can be readily shown to be unjustifiable at the present time. I submit below a statement of the results which are estimated to accrue if the entire suburban service were electrified, compared with the present steam operation:

"Results of operation of suburban business at Chicago for fiscal year ending June 30, 1909:	
Gross earnings	$1,056,446
Operating expenses (82.9 per cent.) plus taxes	946,734
Net revenue	$109,712
"Estimated results under electrification:	
Gross earnings	$1,056,446
Operating expenses (66 per cent.)	$697,254
Taxes	74,427
	$771,681
Net revenue (electric operation)	$284,765
Net revenue (steam operation)	109,712
Increase	$175,053
Estimate cost of electrification	$8,000,000
Interest and depreciation, 10 per cent.	$800,000
Saving in operation under electrification	175,003
Deficit	$624,947

"Our suburban traffic is not sufficiently dense to warrant the expense necessary to electrify these lines, and it is evident from the foregoing figures that even under electrification there would not be an increase in traffic sufficiently large to offset the annual loss from operation. It simply proves that under present conditions of cost of electrification of steam railways, where it means a replacement of a plant already installed, and serving the purpose, it is not justifiable to electrify either in whole or in part your Chicago terminal at this time."

The suburban district of the Illinois Central covers about 50 miles of road and carries in round numbers 15,000,000 suburban passengers per annum, or an average of 41,150 per day, or 1,700 per hour. An increase of 100 per cent. in earnings would not enable the road to break even.

The Boston & Albany reports the result of their study and estimates the requirements as follows: A power station of 6,000 kilowatts will be necessary, with storage batteries to handle the peak load. The total cost of the installation is estimated at $4,000,000, and the interest, taxes and depreciation at 9 per cent., or about $400,000 per annum. A stock argument for electric operation is the saving to be made in operating expenses, but concerning this the following statement is made:

"Some slight economies would accrue in the transportation expenses under this operation, which would be substantially absorbed by the additional expenses to be incurred for the maintenance of the additional apparatus installed, and the net economies would be so small as to be inappreciable in the consideration."

Another stock argument of the advocates of electric locomotives is the growth of traffic which is supposed to result from

electric operation. This argument is met as follows in the report:

"Considering now the possibilities of increasing the traffic, the statistics of the B. & A. R.R. show substantially the following number of passengers handled in the above territory per annum:

1891	4,552,918	1899	3,897,364
1894	4,799,578	1907	4,435,841

"The absence of any material increase in traffic is probably due to the fact that the circuit is occupied as a high-class residential district not susceptible of rapid subdivision of property, and more particularly, to the fact that suburban lines are being rapidly extended into all such outlying districts and afford a more advantageous means of collecting and distributing local travel through the commercial and residential districts than could possibly be afforded by a railway constructed and operated upon private right of way and devoted largely to long haul operations."

EXAMPLE TO ILLUSTRATE A CONCRETE CASE.

The following illustration representing a concrete case is selected because of its elementary character, more especially as the case is so simple that all the variables affecting the comparison are eliminated and the amount of coal to perform the operation is directly known:

Conditions: Trailing load 1,600 tons; average grade, 1.3 per cent.; distance, 8 miles; speed, 15 miles per hour for electric and 14 miles per hour for steam locomotive.

(*a*) Electric

1,600 net tons
190 locomotive (2) tons
1,790 gross tons

$R =$ 1.3% grade x 20 = 26 lbs.; 5° curves. ..... 3 "; Level ..... 6 "; 35 lbs.

$$\frac{\text{Gross tons} \times R \times \text{distance}}{500} = \text{kw.-hr. at the rail}$$

Substituting values:

$$\frac{1{,}790 \times 35 \times 8}{500} = 1{,}000 \text{ kw.-hr. (at rail.)}$$

Equivalent kilowatt load at power house =

$$\frac{\text{Tons} \times R \times \text{m.p.h.}}{500 \times \text{efficiency \%}}$$

Where the efficiency between the rail and generators equals 65 per cent. substituting as before:

$$\frac{1{,}790 \times 35 \times 15}{500 \times 65\%} = 2{,}900 \text{ kw}$$

For this particular case current can be purchased from an adjacent power house at the very low rate of 1 cent per kw.-hr. at the rail.

At this rate the power cost per trip will be 1,000 kw. at 1 cent = $10.

(*b*) Under steam conditions we have the same as before, 1,000 net tons plus weight of two locomotives, 300, or 1,900 gross tons.

The coal consumption for this particular run is 6,000 lbs.

The price per ton to equal the electric cost for power is:

$$\frac{6{,}000 \times \text{price per ton}}{2{,}000} = \$10.00.$$

Transposing:

$$\frac{2{,}000 \times 10}{6{,}000} = \$3.33.$$

But as coal for this particular case costs the road $1.70 per ton, the relative cost, coal against power, is

$$\frac{6{,}000 \times \$1.70}{2{,}000} = \$5.10.$$

There is a difference in ton-mile hours, in favor of the electric locomotive, due to speed and reduced gross tonnage, as follows:

1st Electric $\dfrac{1{,}790 \times 8 \times 8}{15} = 7{,}640$ gross ton-mile hours.

2d Steam $\dfrac{1{,}900 \times 8 \times 8}{14} = 8{,}690$ gross ton-mile hours.

To make the comparison correct the coal consumption of the steam locomotive should be proportioned on the ton-mile hours produced, and the cost of coal then becomes:

$$\frac{\$5.10 \times 8{,}690}{7{,}640} = \$5.80.$$

Adding to the foregoing the other operating costs the relative expense becomes

(*a*) *Electric.* Power		$10.00
Lubrication, supplies, repairs, crew at $0.1158 per 1,000 ton-miles, or $\frac{0.1158 \times 1{,}790 \times 8}{1{,}000}$ =		1.66
Interest and depreciation, taxes, insurance, etc., at 10 per cent.		1.46
		$13.12
(*b*) *Steam* Coal as above		$5.80
Lubrication, supplies, water, repairs, enginemen at $0.25 per 1,000 ton-miles, $\frac{\$0.25 \times 1{,}900 \times 8 \text{ miles}}{1{,}000}$ =		3.80
Interest and depreciation, 10 per cent. (2 locomotives) $\frac{\$34{,}000 \times 10\% \times 8}{365 \times 24 \times 14}$ =		0.22
		$9.82

Cost per trip in favor of steam, $3.30, or 25 per cent. less.

The idea is all too prevalent with the public, and even with some of the bodies that have been given legal power of supervision over railway companies, that any expenditure which can be forced upon the railway companies is just so much gain for the public. Never was there a more absolute fallacy. In the long run, the cost of every bit of railway improvement must be paid for by those who buy tickets and ship freight. Economy in the administration of our railways is just as important in the interest of the general public as if the railways were actually under government ownership.

THE MASSACHUSETTS-NEW HAVEN CONTROVERSY.

The report of the special commission, consisting of three state railway commissioners, the state tax commissioner and the state bank commissioner of Massachusetts, appointed to consider the relations of the New York, New Haven & Hartford to the state, has been handed in to the Massachusetts legislature. The report opens with a reference to the report made last year by the Attorney-General of the state, reciting several points at which the New Haven corporation had violated Massachusetts law and involving the merger with the Consolidated Railway Company of Connecticut and issues of stock and bonds. These violations, the commission says, raise two questions: (1) Should the New Haven company be compelled to forfeit its Massachusetts charter, and (2) if not, what action should be taken?

Expressing the emphatic opinion that forfeiture of the charter should not now be forced, the commission gives its grounds for that conclusion. It cites the large capitalization and plant of the corporation; that Massachusetts savings banks hold $25,459,600 of its bonds and notes, and Massachusetts stockholders to the number of 8,110 hold $35,544,800 of the shares; and that the corporation for thirty years reported to the Massachusetts railway commissioners its various consolidations without encountering resistance from the state, which thus, for that time, slept on its rights. Attention is called also to the facts that the New Haven company is an interstate carrier, that cutting its corporate lines at the state boundary would injure seriously the whole system, would be detrimental to stockholders of leased Massachusetts lines, and that the legalization of the new Boston Holding Company, organized specifically in the interest of the New Haven corporation, may fairly be held to be a legislative answer against the repeal of the charter.

But, if the New Haven is to continue a Massachusetts corporation, the commission argues that the state should be secured in control of such powers as do not fall within the exclusive jurisdiction of another state, and the relation should be established clearly. Past strained relations, in the commission's opinion, have been due to the exercise of privileges granted by the corporation's Connecticut charter, which, if conceded by Massachusetts, would make the New Haven a non-supervised Connecticut holding company outside of Massachusetts' jurisdiction. The New Haven company, on the contrary, ought to be under the control and supervision of the Massachusetts authorities, not only in its acts localized to that state, but its general acts as a corporation, including its general financing, though the authority of other states should be recognized as to matters in their exclusive jurisdiction.

A solution of the problem suggested by the commission is uniform legislation in the interested states, which would necessarily modify Massachusetts statutes and policy, but result in a common rule of corporate conduct. This leads the commission to a brief consideration of the policy of federal control and to the statement that President Taft's recommendations as to restriction on the issue of stocks and bonds by interstate carriers will, if enacted into law, solve some of the questions at issue.

As a final conclusion the commission says that the company, having committed acts in violation of law, should petition the Massachusetts legislature for a healing act, in accord with the

past policy of the Boston & Albany and Boston & Maine corporations. When the petition is filed the legislature should ascertain whether the outstanding obligations of the New Haven are, in the aggregate, secured by the aggregate assets. By this, the commission says, it intends no reflection on the financial soundness of the company, but it is proper for Massachusetts authorities to inquire into the financial affairs of certain of the company's subsidiary corporations. The company should bear the expense of the examination, and the tribunal having authority should select the necessary experts. The legislature will then have the fiscal facts at hand and, if it finds the obligations of the company well secured, a substantial case will have been made out for validating the company's securities. But no securities should be legalized if issued for property other than for transportation or incidental purposes. Also provision should be made for the company's exercise of franchise by appeal to authority without, in each instance, obtaining approval of the legislature. This would give the company a quick and efficient method while securing the supervisory rights of the state. But proceeds of securities to be expended outside the state should be relieved, on presentation of an affidavit, from such restriction. The matter of securing outstanding debentures of the corporation by mortgage upon its property should also be considered. But, the commission concludes, if the company continues to exercise without legislative authority franchises not recognized by Massachusetts, no course remains open other than the repeal of its charter. With effect, "both on the existing leases of the company, its bonds and stocks, and its rights with respect to the Boston Holding Company too apparent for discussion."

All five members of the special commission sign the report.

MALLET ARTICULATED COMPOUND LOCOMOTIVE FOR THE COLOMBIA NATIONAL.

The American Locomotive Company built two Mallet articulated compound locomotives with side tanks for the Colombia National Railway, one of which is shown in the accompanying illustrations.

These engines will be operated on a track of 3-ft. gage, laid with 45-lb. rails. They have a total weight in working order of 127,000 lbs., and will exert a tractive power, working compound of 23,400 lbs., which illustrates very clearly the possibilities offered in the Mallet articulated type for obtaining an engine of large hauling power within the narrow limits of axle load suitable for a light rail.

They will be used in regular road service and are designed to haul 100 long tons on a 4 per cent. grade, compensated for 22-deg. curves, at a speed of 12.5 miles per hour.

Previous to the obtaining of these locomotives, the consolidation type has been used exclusively on the Colombia National, but the Mallet articulated compound type is now being used to obtain greater hauling power.

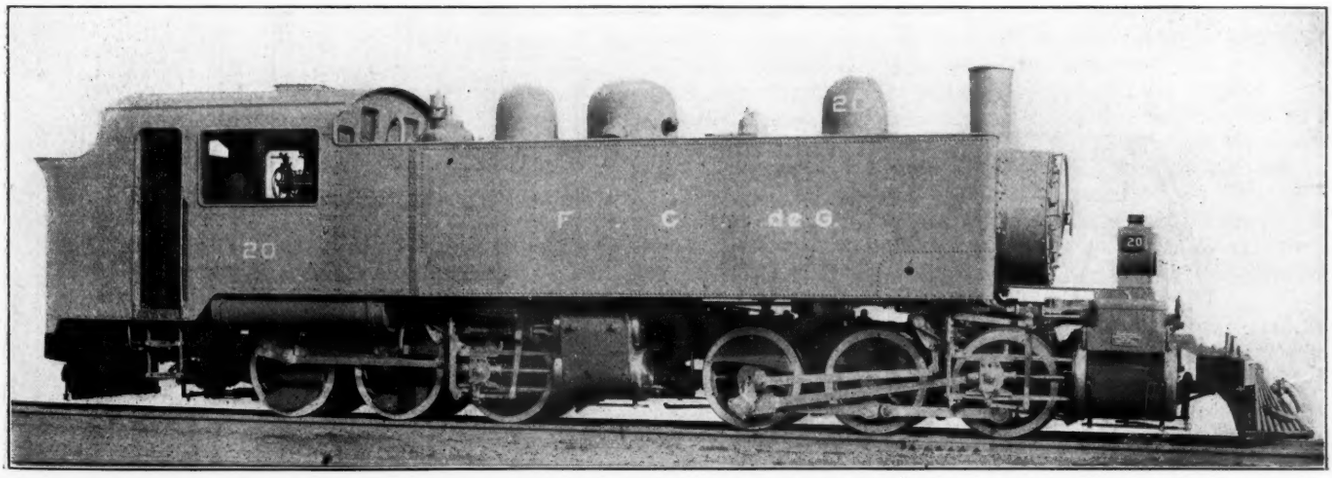
The following tabular comparison between the locomotive here illustrated and some of the consolidation type now in service on this road, built in 1907 by the same company, shows the increase in hauling power obtained with practically the same weight per wheel on the rail. In comparing the two types, it must be borne in mind that while the maximum tractive effort of the Mallet engine, working compound, is 23,400 lbs., this can be increased, in emergencies, to 28,100 lbs. by working the engine simple:

	Mallet.	Consolidation.
Type	0-6-6-0	2-8-0
Diameter cylinders	h.p.13 ; l.p.20½	16 in.
Stroke	20 in.	20 in.
Boiler pressure	200 lbs.	180 lbs.
Diam. driving wheels	38 in.	38 in.
Total weight	127,500 lbs.	94,000 lbs.
Weight on drivers	127,500 lbs.	85,300 lbs.
Av. load per wheel on rail	10,625 lbs.	10,660 "
Tractive effort:		
Working compound	23,400 "	.....
Working simple	28,100 "	20,600 "
Factor of adhesion	5.45	4.14
Rigid wheel base	7 ft. 8 in.	10 ft. 11 in.

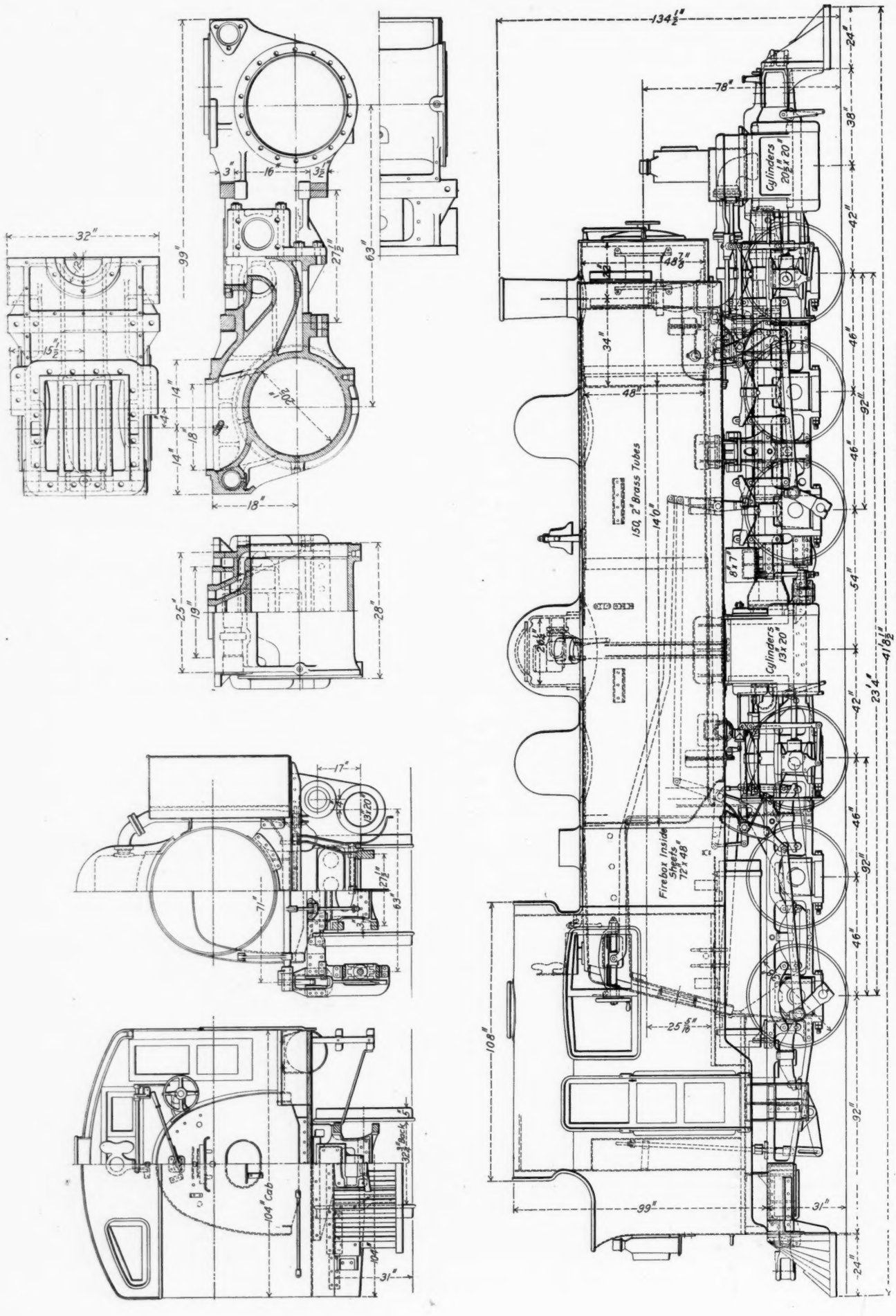
As far as the characteristic features of this type of engine are concerned, such as the arrangement of steam pipes to high pressure cylinders, design of high and low pressure cylinders, flexible receiver pipe connections between high and low pressure cylinders, and flexible exhaust connections between low pressure cylinders and the exhaust pipe in the smoke box, the engines here under consideration are miniatures of previous ones of the articulated type, constructed by the same builders.

The boiler is of the straight top radial stayed type, and is 48 in. in diameter, outside, at the first ring. It is fitted with 150 two-inch brass tubes, 14 ft. long and provides a total heating surface of 1,160 sq. ft., of which the tubes contribute 1,090 sq. ft. and the firebox the remainder. The firebox is 72 in. long and 48 in. wide, extending out over the driving wheels and provides a grate area of 24 sq. ft. The inside sheets are of copper, as are also the staybolts in the water legs, while the radial stays are of wrought iron to the builders' specifications. Wrought iron frames, 3 in. wide, are used throughout. There is a single articulated connection between the front and rear engines which is formed by a cast steel radius arm, bolted to a heavy crosstie between the lower rails of the front frames, and coupled by a vertical pin to a pocket casting secured ahead of the high pressure cylinders between the lower rails of the rear frames. The two groups are equalized together, in the usual manner, by vertical bolts fitted with ball joints, connecting the upper rails of the front frames with the lower rails of the rear frames.

That part of the weight of the boiler and tanks which is



Mallet Articulated Compound; Colombia National Railway.



Elevations, Sections and Low Pressure Cylinder Details; Colombia National Mallet.

carried on the front system is supported by a self-adjusting sliding bearing, located between the second and third pair of drivers, which normally bears all the load. There is also another sliding support, located between the first and second pair of driving wheels, which bears weight only in case of a change in alinement of the frames, due to inequalities of the track or unusual conditions.

This last support is provided with a spring centering device for bringing the front group into line after leaving a curve. Both supports are provided, as usual, with safety straps to prevent the front frames falling away from the boiler in case of derailment.

The high pressure cylinders, which are 13 in. in diameter by 20 in. in stroke, are equipped with piston valves; while the low pressure cylinders, which are 20½ in. in diameter by the same stroke, have Allen-Richardson slide valves. The Mellin system of compounding is used, the intercepting valve being located in the left high pressure cylinder casting. A wrought iron pipe with universal joints leads from this valve to the exhaust pipe in the smokebox, through which the exhaust from the high pressure cylinders is diverted to the smoke stack, when the engine is working simple.

Both sets of valves are operated by the Walschaerts valve gear, reversing being effected by a screw and hand wheel. A new and interesting arrangement of reversing mechanism has been employed. The reversing screw is connected by a reach rod to the arm on the end of the main reverse shaft, which is carried in bearings secured to the shell of the boiler a little ahead of the center of the rear driving wheels of the front group. Connected to the same arm is a reach rod, which extends back along the side of the boiler and is connected to the shaft which operates the valve gear of the high pressure engines. This shaft is carried in bearings, cast integral with the link supports. The reverse shaft, for the low pressure valve gear, is supported in a similar manner on the front frames, and the reach rod from it to the main reverse shaft extends along the center line of the engine and is connected by a double jaw, or universal joint, to a downward extending arm in the center of the main shaft. In this way, the necessary flexibility in the reversing connections is provided, so that the lateral displacement of the front group relative to the boiler when the engine is curving, does not affect the motion of the valves.

With this arrangement of reversing mechanism, the link blocks of both sets of valve gear are raised when being thrown into forward gear. As the low pressure valves have outside admission, and the high pressure valves inside admission, the eccentric crank thus follows the main pin in the first case, and leads it in the latter.

The two side tanks have a combined capacity of 1,800 Imp. gals., and the coal bunker, at the rear of the cab, has a capacity of 100 cu. ft.

The engines are equipped with Westinghouse-American automatic air brakes, operated by a 9½-in. pump. In addition to the air brakes, all four cylinders are equipped with Le Chatelier water brakes.

Some of the principal dimensions of the design are as follows:

Cylinder diameter	13 in. and 20½ in.
Piston stroke	20 "
Boiler, diameter	48 "
Steam pressure	200 lbs.
Firebox, length	72 in.
" width	48 "
" thickness, crown and back	½ "
" water space, front	4 "
" water space, sides and back	3 "
Tubes, material	Brass
" thickness	No. 12 B. & S. gage with No. 10 ends
" number	150
" diameter	2 in.
" length	14 ft.
Heating surface, firebox	70 sq. ft.
" " tubes	1,090 "
" " total	1,160 "
Grate area	24 "
Wheels, diameter, driving	38 in.
Journals, driving	6 in. x 7 in.
Wheel base, driving, each engine	7 ft. 8 in.
Wheel base, total	23 ft. 4 in.
Weight on drivers	127,500 lbs.
Tank capacity, water	1,800 Imp. gals.
Tank capacity, coal	100 cu. ft.
Tractive effort	23,400 lbs.

$$\frac{\text{Weight on drivers}}{\text{Tractive effort}} = 5.45$$

$$\frac{\text{Tractive effort x diameter drivers}}{\text{Heating surface}} = 766.55$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 48.33$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 6.03^*$$

$$\frac{\text{Weight on drivers}}{\text{Heating surface}} = 109.91$$

$$\text{Displacement of 2 equiv. simple cyls.} = 4.74$$

$$\frac{\text{Heating surface}}{\text{Displacement, 2 equiv. simple cyls.}} = 245.0$$

$$\frac{\text{Grate area}}{\text{Displacement, 2 equiv. simple cyls.}} = 5.06$$

*Per cent.

VALUATION OF RAILWAYS IN WASHINGTON.

BY J. C. LAWRENCE,
Member Washington Railway Commission.

The method by which the Railway Commission of Washington determined the reasonableness of rates consisted of the following principal steps: (1) Finding the market value of the property used by the railways for the public convenience; (2) dividing the value of the property in accordance with the value of its use for state and interstate purposes; (3) dividing the earnings, freight and passenger, on state lines; (4) dividing the operating expenses on state lines; (5) segregating operating expenses between freight and passenger traffic; (6) dividing the operating expenses, passenger and freight, between state and interstate use; (7) reaching a conclusion as to the reasonableness of a schedule of rates.

After careful study it was determined that in order to find the market value of the railway property, it would be necessary to have the following elements:

(1.) *The original cost of construction.*—This included unit quantities, to which were added the improvements and betterments.

(2.) *Cost of reproduction new.*—This cost was secured by multiplying the construction quantities as previously determined by the prevailing unit prices of labor and materials at the date of determination, applied to every element entering into the construction and operation of the road.

(3.) *The depreciated value.*—This was secured by deducting from the cost of reproduction new such depreciation as was consequent on the use of the property.

(4.) *The amount and market value of outstanding stocks and bonds.*—With this was included a full financial history of the road showing the various sources from which the moneys for construction and improvements had been derived and how expenditures had been made.

(5). *The density of population and traffic.*

(6.) *The nature and permanency of population and traffic.*—This would show whether increasing or diminishing and, if the latter, the probable life.

(7.) *Facilities for doing business.*—This includes station facilities, terminal facilities, established industries along the line, warehouses used in connection with traffic movement, and, in general, the ability of the carrier to conduct business as a going concern.

(8.) *The physical conditions* under which the road was operated, such as grades, curvatures, fuel supply and other conditions affecting the cost of conducting transportation, and

such other conditions as would appeal to an intending purchaser.

The original cost of construction was secured from the engineering and accounting records of the railways.*

From such investigation the construction quantities were secured. The commission thus ascertained the unit quantities of material and labor. With such quantities, together with the improvements and betterments, a basis of cost of reproduction was secured without the necessity of surveys in the field further than necessary to check the quantities thus found.

COST OF REPRODUCTION.

Having secured the unit quantities of construction, the cost of reproduction new was ascertained by applying prevailing unit prices of material and labor at date of determining cost of reproduction. The cost of reproducing right-of-way and terminal was estimated on the basis of market value of adjacent property, plus the additional amount experience has shown a railway company must pay for consequential damages in securing such property. Such additional percentage of cost above the market value of the property was found to vary in different localities, and, for this reason, careful consideration was given to such varying conditions. The percentage added to market value to ascertain cost of reproduction varied from 15 per cent. in cities of high values to 1,000 per cent. in country right-of-way where the market value of land was only $2 or $3 an acre.

The unearned increment was allowed in the cost of reproduction. This may be either in the cost of construction of roadbed, structures and equipment or in the right-of-way and terminals. To fail to allow such increased value would be as unfair to the public as to the railways. Take, for instance, the terminals of an established road in an important city which were acquired at a low value, say for a million dollars; a new line is constructed and, to acquire its terminals contiguous to and of equal value to that of the established road, pays, say, $10,000,000. If the latter road were not allowed the value it paid then it would be deprived of a return on the amount actually and necessarily invested in acquiring its property, and in that way deprived of the property itself, for the value of the use of the property is in reality the property itself. If this value were allowed to the latter road and denied to the former, then traffic tributary to the one would have an advantage over the other and the construction of additional and competing roads would be discouraged.

DEPRECIATION AND APPRECIATION OF VALUE.

During the investigation a great deal of attention and study was given to the item of depreciation of value. It was estimated that the ties in a road which had been in use for a long number of years were only one-half their value new and that a similar depreciation extended to rails and rail fastenings, bridges, structures and equipment. A good deal of time and money was spent in securing this depreciated value and ascertaining the point to which such depreciation would be carried and what weight should be given to the item of depreciation in making up the market value of the property. The commission concluded that on an established road, maintained to a proper standard of efficiency, there would be no continuing depreciation; that on a newly constructed line there would be a rapid depreciation of certain elements during the first few years. This would apply particularly to ties, and, in a lesser degree, to wooden structures and equipment. On the other hand, there would be an appreciation of roadbed on a new line, due to the seasoning and hardening which follows its use, attributable, not only to settling of embankments, thus rendering the condition of the roadbed more permanent and safe, but to the necessary labor involved in raising and widening embankments, cleaning out and widening cuts, safeguarding them from slides and remedying the defects occurring in construction and the contingencies which necessarily follow. Such appreciated value of roadbed would largely offset the depreciation in the value of the other items.

The appreciated value of the roadbed was added to the estimated cost of reproduction new, and from this sum deductions were made to cover the depreciation of all other items. The depreciation of all other elements, such as ties, rails, bridges, buildings, equipment, etc. was ascertained by the method of mortality tables, the cost being multiplied by the percentage of the years in use to the life of each element. But the depreciated value of a road in profitable operation does not equal its market value. To this depreciated value must be added a sufficient amount to cover the enhanced value due to building up a successful transportation business. It is inconceivable that the value of such a business enterprise

DETAILS OF APPRAISALS OF CERTAIN RAILWAYS IN THE STATE OF WASHINGTON, MADE BY THE RAILROAD COMMISSION, AS OF JUNE 30, 1908.

Account.	Great Northern.	Northern Pacific.	Oregon R. R. & Nav. Co.	Bellingham Bay & B. C. R. R.
Engineering and superintendence	$1,077,601	$2,510,580	$363,206	$35,330
Right of way and real estate	17,105,692	32,862,872	2,248,170	931,189
Grading	14,020,087	20,085,057	3,931,280	319,138
Tunnels	4,261,200	3,143,030	129,545	.....
Bridges, Trestles and Culverts	4,210,692	7,276,348	1,415,160	86,602
Ties	1,432,200	3,117,875	828,472	91,956
Rails	3,929,480	8,904,680	2,276,879	224,918
Track fastenings	767,279	1,714,583	412,095	39,281
Frogs and Switches	82,640	233,000	67,990	10,080
Ballast	879,960	1,981,000	381,457	40,670
Track laying and surfacing	668,360	1,543,675	405,962	48,237
Fencing right of way	80,371	227,682	127,297	18,500
Crossings, Cattle guards and signs	185,774	122,232	23,899	1,063
Telegraph lines	56,622	248,835	15,129	3,486
Station buildings and fixtures	872,365	1,776,748	142,429	41,060
Shops, roundhouses and turntables	300,805	967,803	82,533	19,826
Fuel and water stations	238,200	445,503	100,438	1,254
Shop tools and machinery	181,280	353,408	23,021	23,000
Grain elevators and storage warehouses	125,200	.....	56,214	20,504
Docks and wharves	648,869	1,416,680	.....	.....
Miscellaneous structures	458,174	522,943	187,713	19,863
Legal and general expenses	307,886	502,116	107,678	10,094
Interest during construction	1,758,705	2,911,215	547,970	31,712
Stores on hand	360,904	530,667	241,335	6,378
Unclassified A. & B., June 30, 1906-8	3,002,996	.....	.....	.....
Joint work in Seattle (Accounting records)	91,591	1,535,000	.....	.....
Equipment	4,569,624	14,634,377	1,560,688	268,700
Total cost of reproduction	$61,674,557	$109,267,909	$15,676,561	$2,292,841
Original cost, Company records	$47,029,939	$85,301,693	$14,244,241	$1,739,169
Depreciated value	56,887,079	98,016,645	13,933,672	2,029,148
Market value	59,577,212	110,308,450	19,500,000	1,100,000

[The mileage of the Great Northern in Washington being 806 miles, its average market value per mile, as found by the commission, is $73,900; the mileage of the Northern Pacific in Washington being 942 miles, its average market value per mile, as found by the commission, is $106,500; and the mileage of the Oregon Railroad & Navigation Company in Washington being 501 miles, its average market value per mile, as found by the commission, is $38,900.—EDITOR.]

*The original railway commission act of Washington, passed in 1905, provided that the commission should as early as practicable ascertain the amount of money expended in the construction and equipment per mile of every railway in the state. The commission concluded that the ascertainment merely of the cost of the railways would be of little or no use in regulating rates. It decided that a valuation to meet the views of the Federal Supreme Court must take into consideration "every element that a prudent investor would consider in determining the market value of the property." It, therefore, recommended, and the legislature in 1907 passed an amendment to the commission law authorizing an appraisal based on all these elements.

The commission began carrying out the original statute before the amending act was passed. In its attempts to ascertain the original cost of the roads it was met by some with the statement that their records were incomplete and that it was impossible to furnish even approximately complete statements regarding the original investments. The commisison hired accountants and engineers to get as nearly as might be the data desired. The results were unexpectedly satisfactory. Old papers were found in all manner of out-of-the-way places; and when the data obtained were pieced together they showed in almost complete detail the original cost of every railway in Washington. It is claimed that Washington is the first state to ascertain the original cost of its railways.—EDITOR.

under efficient management should depreciate from a market standpoint.

FACTORS AFFECTING MARKET VALUE.

The market value of the outstanding stocks and bonds is an element required to be taken into consideration by the courts. It is a question as to what extent such consideration should govern in the final result. There is seldom any actual original investment in the stocks of a railway. The funds to meet construction are usually secured from the sale of bonds. A full knowledge of the financial history of a road is important in making up a final determination of market value.

The density of population of the country tributary to a railway is a necessary factor in making up the market value. The density of population is a local condition, but an important factor bearing on the value of the property. The density of traffic is the gage of volume of business. The location of a railway with reference to the density of population is the exercise of judgment on which, other things being equal, the value of the property will be largely contingent.

The amount, permanency and class of traffic handled determines largely the earning power of the road. If the chief commodity handled is forest products coming from an area not adapted to agricultural or other use, the value of the property is low and will diminish according to the life of the traffic. This is true of any other short-lived, low-class commodity. If, on the other hand, the country served is capable of sustaining an increasing population to an indefinite period with a haul of high-class as well as low-class commodities, the property must have a correspondingly increased value.

The value of the facilities for doing business on an established road is an item of great importance. It takes years to build up the business of the carrier. On two roads of the same cost of construction, one new and the other in operation for years, all other things being equal, the older road, with its established business, with grain warehouses along its line in the agricultural communities, flouring mills, saw mills and manufacturing establishments, its perfected terminal facilities and all other facilities which enable it to do business as a going concern, makes it of far greater commercial or market value than the new line. The new road will have such facilities in course of time, but in the meantime, lacking the facilities, it will fail in doing the full volume of business, and would not be, from a business standpoint, of equal value. On a well-established road, well located, with permanent conditions as to population and traffic, such enhanced value would appear to be in excess of any degree of depreciation which would still leave the road in a degree of efficiency for economical operation with safety to the public.

PHYSICAL AND OPERATING CONDITIONS.

Consideration was given to the physical conditions under which a road is operated. If the preponderance of its tonnage movement is down grade, it is a better property than if the reverse were true; and the lower the grade and lighter the curvature, other things being equal, the more cheaply can the road be operated. Hence these are items entering into the determination of value.

Fuel supply is an important item, both as to point of supply and price paid. If a company owns directly or through a subsidiary corporation an ample supply of fuel at a convenient point, value is added to its property. Or where a road has electrified its operations over mountain grades by use of water power which it owns, cheaping and safeguarding operations, it adds to its market value. Or where the tonnage hauled down grade continues on a similar grade in another state, with valuable terminal facilities in another state, all this must be taken into consideration in fixing the market value of the property.*

From a consideration of all of these elements the market value of the property was determined. In one instance[1] it was more than 20 per cent. in excess of the estimated cost of reproduction new; in another[2] about 1 per cent. above the cost of reproduction new; in another[3] it was between the cost of reproduction new and the depreciated value; in still another instance[4] less than one-half the cost of construction new. In the latter case the only commodity of importance was forest products, one-half the life of which had passed. It is a question of the exercise of judgment in determining what a purchaser having the money to invest would pay or an owner willing to sell, but not under compulsion to sell, would take.

All the data on which the determination of the value of the property was based were put in the form of testimony, reduced to writing at the hearings held before the commission to which the roads had been cited to appear and where they did appear and were represented by their attorneys and witnesses. After the testimony was transcribed and exhibits examined, the commission made its findings of fact, which were published, showing in minute detail every item of construction, improvements, betterments, operating expenses, amount and cost of traffic movement, with its conclusions fixing the market values of the properties.

DIVISION OF VALUE, STATE AND INTERSTATE.

The next important step was the division of value of the property as thus found according to its use for state and interstate purposes. Such a division is necessary in order to determine the reasonableness of a state rate. A railway is devoted to two uses; one the conduct of interstate business; the other the conduct of state business. The state commissions have no jurisdiction over interstate rates, and the federal commission has no jurisdiction over state rates. Therefore, unless two returns are to be allowed, one return on the value of the property for state purposes and another return on the same value for interstate purposes, a division of that value must be made. To allow two returns on the same value would be unfair to the shipper. To say that the value is not capable of division is to entirely negative rate regulation by the state, or for that matter by a federal commission, unless the latter assumes jurisdiction over both state and interstate rates. The question of the division of value is difficult and abstruse. Like any question involving rate-making it cannot be understood by a novice. Little surprise, therefore, need be felt because it is a subject little understood, or that it is a subject on which there can be a difference of opinion.

The separate use to which the property is devoted can be easily ascertained. That moving entirely within the state is state business. All other business is interstate. It is, therefore, easy to distinguish between the two different classes of business. The measure of the volume of freight movement is the number of tons hauled one mile, not the tonnage hauled. The unit of measurement of freight is one ton hauled one mile; that of passenger movement one passenger hauled one mile. For convenience, and with substantial accuracy, all items connected with the movement of passenger trains were considered in connection with the passenger movement so as to leave only the two principal items of freight and passenger

* The commission found, for example, that the Northern Pacific controls the Northwestern Improvement Company, which owns large deposits of coal lands in close proximity to the summit of the Cascade mountains, from which it is hauled down grade to points of consumption at a very low cost. These circumstances enabled the Northern Pacific to get its coal for $1.85 a ton in 1906, and $2.00 a ton in 1907, whereas the Great Northern had to pay $2.70 and $2.92; the Oregon Railroad Navigation Company, $3.41 and $3.80; the Tacoma Eastern, $2.68 and $2.57; and the Bellingham Bay & British Columbia, $3.61 and $3.93. The commission held that these conditions tended to enhance the value of the Northern Pacific. In the same way the commission took into account the fact that while the large shops of the Oregon Railroad & Navigation Company, at Portland, are outside of Washington, their existence is a factor in the value of its lines in Washington.—EDITOR.

[1] Oregon Railroad & Navigation Company.

[2] Northern Pacific.

[3] Great Northern.

[4] Bellingham Bay & British Columbia.

movement to be considered. Such uses have two considerations: value and volume.

If all freight moved were of the same classification, and moved at the same cost, then the division of value as far as freight traffic is concerned would be on the volume of the movement as measured in ton-miles, or, in passenger traffic, in passenger-miles. But this is not true. State traffic of low class, such as logs and other forest products, might have little or no interstate movement. High class interstate traffic, such as silks, teas, etc., may have little or no state movement. It is difficult to compare the value of a ton-mile haul of silk with a ton-mile haul of coal, especially where one is state and the other interstate. To make an intelligent division of such value two steps are necessary.

After securing the volume of movement in ton-miles in the different classes and commodities, it is necessary, for the purpose of comparisons, to put them on an equality as to classification which largely governs the rate charged, thus making up a large item of the value of the movement. All such classes and commodities can be reduced to the basis of first-class, say under the general distance tariff, by multiplying the volume of movement of each class and commodity, state and interstate, expressed in ton-miles, by the percentage of the rate charged to the first-class rate. The result, in ton-miles, gives the movement equalized to the basis of the first-class.

If the cost of moving a ton one mile were the same on the shorter state haul, with its larger percentage of main line movement, then the result already obtained would be a sufficient basis for division. But the cost is not the same. Hence the value of a ton-mile is not the same until equalized by the relative cost of the haul.

The method of obtaining the cost of haul is to multiply the ton-mile product obtained by the relative cost of the state to the interstate haul in the different classes and commodities. This gives the ton-miles equalized both as to the classification and cost of haul, and must therefore represent the relative value of the use. It is necessary to keep the ton-miles in the different classes and commodities separate until consideration is given to the relative cost of the haul, as the cost varies in each class and commodity for the reasons given in the paragraph devoted to the cost of traffic movement. The same process applies to a consideration of the passenger traffic.

This method of division is illustrated by the table taken for one of the roads in Washington.

There is necessarily a great deal of labor attached to this method of division, as the ton-mile movement, percentage of rate to first class and relative cost of service must be obtained. After the above table was prepared and the division made, it was found that the ton-miles hauled, state and interstate, multiplied by the average rate, multiplied by the average cost, gave substantially the same result. This method could be used with substantial accuracy and greatly lessened the labor and expense in making the division. The latter items are easily obtainable. The table will serve, however, to explain the method of division used by the commission, although the result might be reached in the other way.

The division of operating expenses on state lines is not so difficult, as railways usually keep their operating expenses by operating divisions, and this divided between main line and branch line, and the expenses or money expended under or by direction of the division superintendent is charged direct to the operating expenses of each division. Such expenses include nearly all amounts expended for "Maintenance of Way and Structures," "Transportation" and "Repairs and Renewals of Equipment." Any item of expense that cannot be allocated to a division, such as "General Office Expense," etc., is apportioned on an arbitrary basis, usually the same

	Ton-miles handled.		Percentage of rate to first-class.		Product of ton-miles by percentage of rate		Relative cost of ton-mile haul.		Product of ton-miles as equalized by relative cost.	
	State.	Interstate.	State.	Interstate.	State.	Interstate.	State.	Interstate.	State.	Interstate.
Less carloads	1,031,474	1,546,384	.471	.420	485,824	649,481	3.9423	1.00	1,915,263	649,481
Grain	12,711,744	1,664,937	.147	.117	1,868,626	194,798	.8820	1.00	1,648,128	194,798
Lumber	2,123,708	34,851,693	.121	.109	256,969	3,798,835	1.4499	1.00	372,579	3,798,835
Logs, etc.	1,159,634	341,097	.056	.075	64,950	25,582	1.6635	1.00	108,028	25,582
Coal	442,144	928,624	.112	.055	49,520	51,074	1.8235	1.00	90,300	51,074
First class	30,568	680,769	.373	.272	11,402	185,169	1.2065	1.00	13,757	185,169
Second class	3,886	243,776	.343	.313	1,333	76,302	1.2065	1.00	1,608	76,302
Third class	99,474	1,668,514	.204	.398	20,293	664,069	1.2065	1.00	24,484	664,069
Fourth class	226,408	404,488	.390	.250	88,299	101,122	1.2065	1.00	106,533	101,122
Fifth class	576,281	5,732,289	.213	.140	122,748	802,520	1.2065	1.00	148,095	802,520
A	96,724	3,359,668	.213	.140	20,602	470,354	1.4287	1.00	29,434	470,354
	110,068	1,309,627	.288	.261	31,700	341,813	1.2065	1.00	38,246	341,813
	38,625	546,685	.288	.261	11,124	142,685	1.8258	1.00	20,310	142,685
B	45,592	227,525	.265	.263	12,082	59,839	1.2065	1.00	14,577	59,839
C	5,699	111,957	.140	.164	798	18,361	1.2065	1.00	963	18,361
D	498,303	2,807,675	.122	.110	60,793	308,844	1.2065	1.00	73,347	308,844
	97,506	653,950	.122	.110	11,896	71,935	1.3836	1.00	16,459	71,935
E	336,732	213,426	.078	.068	26,265	14,513	1.2065	1.00	31,689	14,513
	424,609	97,163	.078	.068	33,120	6,607	1.8574	1.00	61,517	6,607
Total	.....	.....	....	....	.....	.....	.....	....	4,715,317	7,983,903
Per cent.	.....	.....	....	....	.....	.....	.....	....	37.13	62.87

	Passenger miles		Rate per mile.		Percentage cost per mile.			
	State.	Interstate.	State.	Interstate.	State.	Interstate.	State.	Interstate.
	41,733,908	21,145,473	.028863	.028107	.8781	1.00	1,057,729	594,336
Per cent.	.....	.....	.....	.....	.....	....	64.02	35.98

Total freight earnings were 70.83 per cent. and total passenger earnings were 29.17 per cent.

Hence: State freight..... .3713 x .7083 = .2630 } 44.97 per cent. state.
State passenger... .6402 x .2917 = .1867 }
Interstate freight. .6287 x .7083 = .4453 } 55.03 per cent. interstate.
Interstate pass'gr. .3598 x .2917 = .1050 }

In order to arrive at the operating expense by state lines, the formula for apportioning to operating divisions is applied, and the boundaries of the state become the limit of the division, except that the "terminal" and "assembly expense" are apportioned to one-half the entire interstate haul and prorated in the state on a straight ton mileage basis.

The earnings on state business are easily ascertained, but the interstate earnings must be assigned to the state.

Having divided the operating expense between state and interstate in the manner heretofore given, the earnings from interstate business can be divided on a straight ton-mileage prorate.

Several methods of dividing the operating expenses between freight and passenger business have been used. A careful examination of the various methods when applied to the same conditions shows a variation of only about 1 per cent. between all of them. The method used by the Railroad Commission of Washington was the simplest of all. Assume that the cost of movement of two average empty freight cars equals the cost of movement of one average loaded freight car, and of two average loaded freight cars equals the cost of movement of one average passenger car. Then reduce the on all roads, and where a difference exists the final result in dollars is not materially changed.

freight car mileage to the basis of the movement of a passenger car, and compare the mileage thus obtained with the passenger car mileage. The division of operating expenses as thus made was compared with the method of division adopted by the Minnesota commission, with a difference of result of only about three-fourths of 1 per cent.

The division of operating expenses between state and interstate business was made as follows:

The average cost of moving the net and gross ton-miles was ascertained. Then a careful study was given to the relative cost of movement of the various classes and commodities. The aid of an experienced railway accountant and traffic man was secured for this purpose. In order to form an intelligent judgment, attention was given to the average distance each class and principal commodity was hauled, the net weight of the contents of the car, the empty car movement connected with each haul, the manner of movement, whether in train loads or smaller shipments, whether moving continuously or for a short time; the place of movement, whether over branch line with heavy cost of operation, or cheaply operated main line, with percentage of haul on each, and the cost of moving an average gross and net ton over the branch lines and main line in each division. By procuring the average distance the average net ton is hauled, the average net weight of the contents of the car carrying same, the proportion moving over branch and main line on the different divisions, a basis of comparison was obtained. It was found that the cost of moving the average ton one mile was several times greater on the branch line than on the main line in certain instances. This was due to the physical conditions of grade and curvature, empty car movement, assembly charges chargeable to branch line operation, the smaller initial movement on branch lines, as compared with full train tonnage on main line haul, and other reasons, varying with specific instances.

The data for such determination was obtained from the received abstracts and settlement sheets with connecting lines in the office of the general auditor, showing all freight moving to and from each station in the state, the total length of haul, proportion within and without the state, the class and commodity, the position of the line by divisions and branches such freight passed over, all as to freight forwarded and received and freight passing entirely through the state. From such data was obtained the percentage which the ton-mile of each class and commodity, state and interstate, bore to the total ton-miles hauled, the average distance hauled, state and interstate, the distance interstate freight was handled within and without the state, the relation of branch line to main line haul, and, in short, every element of fact connected with the movement of each class and commodity which the commission felt should be considered in estimating the relative cost of movement.

With information showing the distance the average ton of freight moved, state and interstate, the average net tons per car, that the ton-miles were made up of a given percentage of lumber, of grain, of logs and other forest products, or iron and and steel articles, of coal and similar information as to each commodity making up the total ton-miles hauled; the percentage of the empty car mileage to the total car mileage, the percentage of the empty car mileage connected with the haul of each commodity to the total car mileage, etc., the commission was able to determine the relative cost of movement of each class and commodity compared with the cost of moving the average net ton-mile. The commission did not adopt a theory for dividing operating expenses, state and interstate, but made the division on facts applicable to each particular case.

The cost of freight and passenger movement having been previously segregated, the cost of passenger operation, state and interstate, was divided in proportion to the state and interstate passenger miles. This was considered equitable, for the reason that there were no through interstate trains operated in this state, all passenger trains handling both state and interstate passengers.

DETERMINATION OF REASONABLENESS OF RATES.

The determination of the reasonableness of rates is a condition to be drawn from the facts found and enumerated. That portion of the value of the property found to be devoted to state use was regarded as the capitalization on which the company was entitled to earn a reasonable return. The amount of such returns was not definitely fixed, but assumed at 7 per cent. To this was added that portion of operating expenses chargeable to state traffic. This amount was deducted from the earnings on state traffic, the remainder showing the excess over what was determined to be reasonable earnings. On final analysis the result was only approximate.

The period of investigation covered an average of five years. Such period is too short to include all possible or probable contingencies. Allowance must be made to cover the unusual, the extraordinary conditions. The period of investigation was that of unusual prosperity. It is necessary to take into consideration the lean years as well as the fat—periods of depression as well as periods of prosperity. Rates cannot be increased during hard times to meet operating expenses and fixed charges. It is only the part of prudence and good business judgment to lay up a surplus in prosperous times to meet the contingencies, not only of decreased traffic, but increasing operating expenses. It is hard to fix a rule by which this may be done. It is a question of the exercise of sound business judgment. The state cannot limit the earning power of the railway to a fixed amount one year and leave it without funds to pay the operating expenses and fixed charges of the ensuing year. The right to earn a reasonable return on the value of the property means a right to such return each year. A year of deficits must be provided for by a surplus from prosperous periods. Such surplus should not eventually exceed the deficits. Allowance must be made, too, for the perfection of roadbed and equipment. Such expenditures which might not reasonably be required during construction period must be met out of earnings. The earnings of a railway are measured by the rates charged.

COST OF SERVICE AND VALUE OF SERVICE.

The considerations enumerated apply to a schedule of rates, not to a particular rate. The former may be measured, or approximated, from the considerations given, but in making up a particular rate many other items must be considered, so that the cost of performing the particular service is only one of many elements considered in the making of a particular rate. The failure to make this distinction has led to a great deal of controversy on the subject of rate regulation. The theory of cost of service applies to a consideration of an entire schedule of rates with due allowance for contingencies. The application of this theory to the making of particular rates may prove entirely impracticable. The making of such rates calls into use the best judgment and matured experience of traffic men. The inter-relation of the complex system of rates in effect on a given road requires a thorough knowledge to master, and cannot be properly regulated without the exercise of the same knowledge and judgment as possessed by the men who are charged with making them.

If an entire schedule of rates shows earnings in excess of reasonable requirements, after allowing for all contingencies mentioned, then a reduction in rates is due. Such reduction would have to be apportioned among the different classes and commodities. To make such a distribution of reduction requires the exercise of the greatest care and judgment. The commission must investigate the entire fabric of rates so as to give an intelligent consideration before taking action. Business thrives on fixed conditions. A fluctuation of rates tends to disorganize business. The railways are entitled to reasonable returns and the public is entitled to pay no more than fair rates. From the very nature of the business, in the

variation of the amount of traffic and fluctuating conditions from year to year, there will necessarily be a fluctuation in the net revenues of a railway company.

An attempt to make a new regulation with each increase in net returns would be disastrous to business conditions. When the commission has made a determination of the reasonableness of a schedule of rates which effects a reduction in rates, that reduction should be promptly apportioned to the various classes of traffic and then a reasonable period of time should follow before a re-determination is attempted. What that period of time is the Washington commission has not attempted to say. An average period of five years on a railway in existence 15 years is a short period of time. A period of 15 years would not cover the extraordinary contingencies likely to arise either in the amount of the traffic or cost of conducting transportation. It will be long years before the time comes that conditions have become so fixed that such contingencies should not be allowed for.

In the final conclusion reached by the Railroad Commission of Washington, a reduction in grain rates approximating $750,000 per annum on the railways in Washington was made. Consequent reduction in the adjoining states, owing to the inter-relation of rates, increased this amount to about $1,250,000 per annum. These rates became effective November 1, 1909. From the findings of facts by the commission, as previously explained, no appeal was taken by any of the railways affected, and the decision of the commission, under the laws of Washington, became final. On the final order making a reduction in rates named, no appeal was filed by any of the railways, and the reduction became effective as stated.

UNIT SYSTEM OF ORGANIZATION ON CENTRAL SOUTH AFRICAN RAILWAYS.

A unit system of organization very similar to the Hine system has been established on the Central South African Railways (Transvaal and Orange River colonies) as a result of a report by the Colonial Railway Commission. The *South African Railway Magazine* for September says:

"The principal alteration has been the amalgamation of the traffic, locomotive running and maintenance engineering departments, which were formerly controlled and worked under the departmental system, into the transportation department, administered under what is known as the divisional system.

"The traffic and locomotive running departments were amalgamated in May, 1908, and further amalgamated with the maintenance engineering, open lines, in May, 1909. To provide for the new conditions of working, a scheme of organization which has been introduced embraces all the principles of the divisional system, and modified slightly so as best to suit the local requirements of South Africa. Titles such as assistant chief engineer, personal assistant, traffic manager, assistant traffic manager, locomotive superintendent, assistant locomotive superintendent, resident engineer and district engineer, previously in use on the C. S. A. R., have been abolished, and the principal officers are now uniformly styled superintendents or assistant superintendents.

"The organization, as is stated, has been designed to facilitate and afford opportunity by the principal executive officers of the railway to acquire an all-round knowledge and training; to develop the best ability of the staff; to encourage officers to assume responsibility for their actions, and to give each superintendent or assistant superintendent a common interest in the whole of the working of the transportation department.

"Railway working under the departmental system where the traffic manager is concerned only with the conveyance of passengers and goods, the locomotive superintendent with the running of engines, and the district engineer with the maintenance of the line, is being gradually altered despite the conservative policy of many railway officers.

"Under the divisional transportation system, each divisional officer becomes a general manager (in miniature) of his section; he carries the responsibility of the complete working of his unit, and both he and the officers associated with him have the interests of the whole division placed under their combined care. At headquarters (Johannesburg) each superintendent or assistant superintendent is responsible direct to the assistant general manager (designated general manager or general superintendent on other railways) for the particular section of work delegated to him.

"The professional and technical officers are as far as practicable relieved from office detail in order that they may devote the major portion of their time to their legitimate professional and technical duties. The correspondence is mainly conducted in the commercial and administrative branch, under the control of the superintendents responsible for the particular section of work concerned. Separate files of correspondence are abolished, and such matters and correspondence as the professional and technical officers concerned should see or be consulted upon are referred to them by persona' consultation or endorsement on the file for advice or decision.

"The policy of decentralizing authority in one large office by placing specific responsibility on certain appointed officers directly responsible to the head of the department has been applied successfully for some years in the traffic department of the Central South African Railways, under the departmental system of working, and the further combination of offices at headquarters, with consequent reduction in the number of supervising officers from 24 to 11, has manifested clearly the wisdom of extending the principle.

"Uniformity of policy on the several districts is achieved by the central authority, and by frequent meetings of the controlling staff.

"Under the proposed scheme, one of the objects in view has apparently been to cut out red tape and eliminate as much as practicable management by office deputy or chief clerk.

"The organization of the transportation department on most of the American railways covers the movement of traffic (operating) and maintenance of the line only. The commercial work of the railway is usually performed by an entirely different department, termed the 'traffic' department, responsible for the development of traffic and for the tariffs, fares and generaliy for the commercial advancement of the railway. In the organization adopted on the Central South African Railways, the commercial and administrative work is controlled from the same office. The great necessity for adopting in South Africa a scheme of the kind outlined has been apparent for some time. The main characteristics of this country require treatment different to the working in America, with its vast population and the largest transport of traffic in the world. South Africa has an enormous but thinly populated territory, in which railways occupy an important part in the development of the country, and the only traffic which corresponds in any way to the larger railway systems of the world—and even then the traffic is comparatively small—lies in the industrial center of the gold-mining area, and at Capetown and Durban in their suburban traffic. With these main exceptions the traffic is dealt with on a single line of railway, and the administration cannot be divided into the several administrative positions followed by other administrations in the shape of departments for passengers, goods, mineral, operating and other similar divisions, having due regard to economy, but provision has been made in the system for these changes as and when expansion of work renders it expedient.

"It is thought that the present organization will result in greater efficiency, while the reduction in the working costs under the transportation system is estimated to be not less than $1,250,000.

"The organization is such as to be capable of extension to the whole of the railways of South Africa, covering nearly 8,000 miles, when unified under the provision of the act for the Union of South Africa, to be controlled by a board of three commissioners and a cabinet minister as chairman."

General News Section.

The Boston & Maine has made an increase of 10 per cent. in the wages of 470 clerks employed in the general offices at Boston.

John F. McNamee, editor of the *Firemen's Magazine*, is going to establish a school in Indianapolis for instructing engineers and firemen.

The Governor of Ohio has revoked the commission of Oscar Rickey, a railway detective, on complaint of citizens that he was guilty of cruel treatment of persons arrested.

A press despatch from Cincinnati says that the Cincinnati, New Orleans & Texas Pacific has made a new agreement with its telegraphers, by which there will be an increase of about 10 per cent. in wages.

The Chicago & North Western has just taken title to the land which has been bought within the past few years to make up the site of its new terminal passenger station in Chicago; and the gross amount paid was $9,537,890.68.

The Louisville & Nashville contemplates using telephones for train despatching on its Knoxville division. It already has this system in operation on the New Orleans & Mobile division, 140 miles, and on its Cincinnati & Louisville division, 110 miles.

An officer of the Delaware, Lackawanna & Western says that his company is going to buy and establish experimental farms, following the example of the New York Central. The company will be willing to turn the farms over to the New York State Department of Agriculture.

About 30 suits have been filed by the railways of Indiana contesting the validity of the order issued by the State Railway Commission requiring them to equip their locomotives with headlights of not less than 1,500 candle-power. Governor Marshall has decided to back the commission in its defense of the suits, which means that the Governor will draw on his contingent fund to help pay special attorneys to assist in the defense.

The legislature of Massachusetts has before it a bill to require an annual tax of $300 on each railway dining car on which liquor is sold. At a hearing before the legislative committee last week the representative of the New York, New Haven & Hartford said that the profits enjoyed by that company from the sale of liquor on its 13 dining cars amount to 85 cents a day. If a high license should be imposed the company would simply abolish the sale of liquor on the cars.

The Rock Island and the St. Louis & San Francisco have arranged for segregation of their coal properties. The Consolidated Indiana Coal Company, controlled by the Rock Island, has taken over the sale of its own output, which has been handled by the Brazil Block Coal Company, controlled by the Chicago & Eastern Illinois. The following officers of the Consoidated company have been elected. President, H. U. Mudge; vice-president, Carl Scholz; comptroller, F. Nay; treasurer, G. H. Crosby. All are officers of the Rock Island.

According to a press despatch from Guadalajara, Mex., James A. Cook, an American, a conductor of a freight train on the National Railway, must go to prison on a sentence of two years and six months, because freight was stolen repeatedly from cars on his train. The reports indicate that the freight was stolen by the Mexican brakemen and that Cook did not participate in the robberies, but he was held, nevertheless on a charge of criminal negligence. It is said that it will be possible for a prisoner in a case like this to get his sentence reduced one-half.

The Mackay companies have decided to sell their holdings of American Telephone & Telegraph stock, amounting to $8,200,000. In a statement given out by the company it is said that this policy has been adopted because after the recent purchase of control of Western Union by the American Telephone & Telegraph, public opinion has viewed with suspicion the relation between the Postal Telegraph Co., which is controlled by the Mackay companies, and the Western Union, and therefore the Mackay companies will divest themselves of all interest in the Western Union. The Postal Telegraph Co. will continue to be operated as an independent company.

The Interborough Rapid Transit Company, operating the subway and elevated railways in Manhattan and The Bronx, New York City, including also a line to Flatbush avenue, Brooklyn, reports that during the year ending December 31 last the total number of passengers carried was 543,172,774, which is about 48 millions more than in the preceding year. The gross revenue was $27,963,376, or about two and one-half millions more than in the year preceding; operating expenses, $10,759,738, a decrease of about $110,000; net operating revenue, $17,203,638; taxes, $1,692,651; other income, $737,689; total income, $16,248,676, an increase of $2,351,698 over the preceding year. The deductions are: $10,468,035 for interest, rent, etc., and $3,150,000 for dividends; surplus for the year, $2,630,641; surplus preceding year, $538,447.

Representatives of railway brotherhoods say that questions of increase of pay will not be pressed on the eastern railways generally until it is seen what can be done with the Baltimore & Ohio, with which negotiations are now going on. It is the purpose of the brotherhoods to secure as high rates of pay in the East as in the West, and the Baltimore & Ohio is a good road on which to begin the campaign because a number of the wage schedules on that road are already on the western basis. A statement is published showing the pay of through freight conductors and brakemen per 100 miles on five prominent roads, as follows:

	Conductors.	Brakemen.
Baltimore & Ohio	$3.465	$2.31
Cleve., Cin., Chic. & St. Louis	3.25	2.20
Lake Shore	3.20	2.20
Delaware, Lackawanna & Western	3.20	2.20
New York Central	3.00	2.15

At the office of the New York State Public Service Commission last week, Thursday, 50 representatives of the Brotherhood of Locomotive Engineers called on the commissioners and conferred with them. The report of the conference indicates that an exchange of compliments was the principal thing done, but the engineers presented a few "criticisms" of railway practice in the state. One of these was to the effect that signal lights were not always bright enough, and the commission promised to investigate the subject. It was declared that the elevated roads in New York City were insufficiently signaled, and the chairman of the commission said that he would refer the matter to the commission having authority in that district. Complaint was made that on certain roads the number of tail lights on freight trains has been reduced from four to three. The engineers spoke in favor of the 16-hour labor law—that passed by Congress and that passed by the legislature of New York being substantially alike—and said that runs ought to be arranged so that an engineer would not have to rest at unpleasant places remote from his home. The degree of safety to be attained in the operation of engines with defective parts was discussed.

Prospective Surpluses for Dividends.

Estimates of the surplus earnings of the principal railways of the country during the calendar year 1909 bring to light some surprising results. Balances applicable to dividends on common stocks have in some cases dwindled to even lower figures than those of the year of depression, 1908, while in other cases the year was one of notably good profits.

The former conditions, that of unsatisfactory earnings on stock, applies chiefly to roads which have been issuing large amounts of new stock, representing construction and other investment not yet fully productive. Improved financial returns are evident in a few cases in which the railways concerned were most critically affected by the financial conditions succeeding the end of 1907. Erie and Wabash are instances in point.

Below are given the actual earnings and the closely esti-

mated surpluses for common dididends of twenty railways whose securities are actively traded in on the Stock Exchange:

	Gross earnings.	Surplus for common divs.	Earn'gs on stock, per cent.
Atlantic Coast Line	$27,892,100	$5,835,000	11.6
Atchison	100,001,000	16,792,000	10.3
Baltimore & Ohio	78,149,250	12,290,000	8.0
Chesapeake & Ohio	28,882,500	5,154,500	8.2
Chic., Mil. & St. Paul	61,300,000	5,430,700	4.7
Delaware & Hudson	23,398,500	5,180,000	12.2
Denver & Rio Grande	22,332,000	711,600	1.8
Erie	52,819,700	1,844,000	1.6
Great Northern	57,780,400	19,145,000	9.1
Illinois Central	58,962,300	7,600,000	6.9
Louisville & Nashville	47,925,500	10,500,000	17.0
Missouri Pacific	49,411,000	2,832,000	3.5
New York Central	93,171,000	14,000,000	7.8
New Haven	57,778,000	11,292,000	11.2
Northern Pacific	70,778,200	21,135,000	8.6
Pennsylvania	153,565,000	24,100,000	10.5
Southern Railway	54,893,200	1,550,000	1.3
Southern Pacific	127,692,700	31,500,000	11.5
Union Pacific	83,961,200	39,500,000	18.2
Wabash	27,432,000	900,000	*2.2

*On preferred, which is entitled to 7 per cent.

Some of these figures require explanation. Thus, 10 per cent. on Atchison looks small, but this figure is based on $163,000,000 common stock, the amount now outstanding. On $125,000,000 stock, which is about the average amount outstanding during 1909, the balance over preferred dividends would be equal to 13 per cent.

St. Paul's balance, too, looks incredibly small, but it is figured on all the increased amount of stock now outstanding. It takes in earnings of the Puget Sound road, to finance which the new stock was issued, for only six months, and most of that period before the extension had had time to develop traffic or get itself shaken down to smooth operation.

The New Haven percentage is based on $100,000,000 stock, the amount outstanding in the hands of the public most of the year. There is $21,000,000 more of the stock in the treasury of the New England Navigation Co., or was, at last official accounts, but if dividends are paid on this stock, the money will sooner or later find its way back into the New Haven treasury.

Union Pacific's percentage, 18.2 per cent., is based on $216,500,000 common stock outstanding January 1 last. As is known, the road is earning and receiving from its investments the equivalent of considerably more than that rate now. An official income account for the first five months of the fiscal year, those ended November 30, 1909, showed 23 per cent. on the present volume of common stock.—*Wall Street Journal.*

The International Railway Congress.

Delegates to the International Railway Congress, Eighth Session, to be held at Berne, Switzerland, July 3-16, have been appointed by about 60 American railway companies. The six delegates appointed by the United States government are: Franklin K. Lane, of California, Interstate Commerce Commissioner; Edgar E. Clark, of Iowa, Interstate Commerce Commissioner; Fairfax Harrison, vice-president, Southern Railway Company; W. A. Garrett, formerly general manager, Seaboard Air Line; J. A. Brown, vice-president of the Railway Equipment and Publication Company; Colonel H. S. Haines, formerly president of the American Railway Association.

Education for Railway Service.

The Bureau of Education, Department of the Interior, at Washington, has issued a pamphlet of 159 pages on "Education for Efficiency in Railroad Service," by J. Shirley Eaton, which forms a compendium of information on the subject named which is quite unique. The author has carefully gathered up the salient features of all of the important enterprises of this kind that are to be found on American railways, including the elaborate plan which has recently been put in force on the Union and Southern Pacific under the direction of Mr. Athearn, and with which the readers of the *Railway Age Gazette* are familiar.

Mr. Eaton opens with 20 or 30 pages of introduction and philosophy, and then gives synopses of the curricula and methods of the principal railway educational enterprises. He tells of the apprenticeship systems in the mechanical departments of the New York Central, the Pennsylvania, the Atchison and other roads, and of the Elmira Telegraph School, fostered by the Erie. Notice is given of the work of McGill University, Purdue, Cornell and Chicago Universities, the University of Illinois and Dartmouth College. The plans and methods of the International Correspondence School and of the School of Railway Signaling are set forth. In addition to these and other chapters, dealing somewhat in detail with each institution, there is at the end a tabular summary, filling 10 pages, in which the main points are given concerning every railway apprenticeship system that was heard from. Sixty-seven railways are represented in this table.

A notice of this book will be found on the editorial page, and below we give the conclusions with which Mr. Eaton sums up his work.

Railway financial managements should incorporate an educational scheme as a definite part of their policy, on the ground of business prudence. Such policies should be inaugurated for periods of not less than five years, preferably ten; otherwise the money appropriated will be largely wasted.

Railways should extend the principles of definite apprenticeship to every department of the service, and should provide for two or more grades of apprentices in order to take account of differences in capacity and work done elsewhere, either in properly accredited schools or by experience, and leading to different grades of service.

There should be formal provision for movement among departments under proper conditions, and the comity of railways should be so far extended as formally to provide for some interchange of officials under special restrictions.

In executing the policy of education announced by the directors, there should be a superintendent of education reporting directly to a higher official, such superintendent to be thoroughly informed of the educational policy of the railway and the broad considerations on which it rests. His department should systematically recruit the employees throughout the service and certify on request to their records and general efficiency in the early stages of promotion.

Efficiency should be recognized by an efficiency wage, stated distinctly apart from the seniority wage.

Employees should be encouraged to take outside courses of instruction or experience without forfeiting their tenure, and, so far as possible, the educational department should systematically turn to account every outside educational agency by suggesting courses, uniting in co-operative courses and recognizing the work done in these courses, to the end that theory and practice be joined.

The educational opportunities of the service should be utilized to the utmost by encouragement of perfect freedom of study and criticism and interchange of ideas concerning accidents, bad work and all the details of practice. Annual or semi-annual meetings of employees by classes of work and the preparation and circularization of papers and discussions should be a feature.

The time will come when railway employ for every man in the service will not mean drudgery, nor sinecure, nor accidental opportunity, but an enlightened, stimulating, highly efficient service of highest earning power, least uncertainty from accidental causes, largest freedom for individual initiative, entire self-respect and thoroughly democratic spirit.

Arbitration of Demands of Chicago Switchmen.

The railways in the Chicago switching district and representatives of the Brotherhood of Railway Trainmen have agreed to arbitrate their differences before the Illinois Board of Arbitration. This agreement involved a very substantial concession by the railways. The general managers originally proposed arbitration under the Erdman act. The employees made a counter proposal of arbitration before the Illinois board. The railways at first rejected but later accepted this proposition. Their reason for hesitating to accept it was that B. F. Shadley, chairman of the board, is a member of the Brotherhood of Railway Trainmen. Besides Mr. Shadley the board is composed of Harry M. Powell, editor of the *Peoria Star*, and Charles Piez, president of the Link Belt Machinery Company of Chicago. As a result of conferences

subsequent to those referred to in our issue of last week, page 322, the number of questions to be arbitrated has been reduced to three. These are the demands of employees (1) that they be given an increase in wages of 5 cents an hour, which would make the pay of yard conductors 40 cents an hour for day work and 42 cents an hour for night work, and that of brakemen 37 cents an hour for day work and 39 cents an hour for night work; (2) that overtime shall be paid for at the rate of time and a half, and any switchman who works a fraction of an hour shall be paid for a full hour's work, and (3) that yard men taken out of the service shall be given a hearing within three days, and if the hearing is delayed longer than this he shall receive regular pay for the additional time.

Steel Passenger Cars on the Pennsylvania.

The Pennsylvania Railroad now has in service on its passenger trains 324 steel cars, and the illustration given herewith is from a photograph of the first complete train embracing steel cars of all classes—coaches, dining car, Pullman car and baggage car. The label on this photograph states that this is the first train of the kind ever made up. The first order for all-steel passenger cars given by the Pennsylvania was issued in November, 1906, and called for 100 cars. Since then other cars have been ordered, making up the number above mentioned, and with still other orders now being filled the company will have 630 all-steel cars, including 385 coaches, 44 dining cars, 69 combination (passenger and baggage), 33 baggage cars, 60 postal cars, 27 mail storage cars and 11 combined baggage and mail cars. In addition to these the Pullman Company is building 500 steel sleeping and parlor cars to be used on the Pennsylvania road. With these and with steel cars to be ordered by the Pennsylvania during the current year there will be 1,400 steel cars in service. As our readers know, these cars have steel frames, steel sheathing and steel inside finish, leaving nothing combustible except the cushions.

First Composite Passenger Train of Steel Cars.

Railway Matters in Washington.

Washington, Feb. 16.

A sub-committee of the Senate Committee gave a hearing last Monday on the bill providing for federal inspection of locomotive boilers. Representatives of the enginemen's and other railway brotherhoods spoke in favor of the measure, and officers of a number of the principal railways opposed it.

Representative Mann, chairman of the House Committee on Interstate Commerce, expects that his committee will report out the administration railway measures by March 1.

At the House committee hearing on the Townsend and Mann bills last week, Roberts Walker, chairman of the executive committee of the Chicago, Rock Island & Pacific, made a strong argument against the proposal to prohibit one railway from acquiring stocks or bonds of a competing line. Following are some of his points:

"I am, by inheritance and by training, a believer in the interstate commerce act as thus far enacted. The carriers of the country must be required to adjust themselves to the policy, adopted by the federal government in 1887 and of increasing importance with the growth of the gap between large businesses and small ones, that all shall be served alike and at the same rate. All railway men yield without demur to the successive applications of this principle. Every degree of regulation of rates and of service, no matter how drastic as long as the essentials of equality to the shippers and just remuneration to the carriers are kept uppermost, is for the best good of the nation and the railways alike. It is the spirit of our institutions that all businesses and all men engaged in business or professional activities shall be free and unfettered. We have inherited from the earliest days of the common law an abhorrence of arrangements resulting in restraints of trade. . . .

"Mr. Townsend's bill prohibits every railway from acquiring the stock or property of any other railway. This is nothing short of enacting that no man shall buy the house or the farm of any other man. It puts the nation in the position of restraining trade to a far greater degree than was ever attempted by any human being or corporation. It robs the public in advance of the saving and advantage that always follows the absorption of one line by another accruing from decreased expense of superintendence, greater aggregate supply of equipment to adapt to the needs of the enlarged mileage, increased uniformity of operation and better opportunities to improve the property out of the combined resources.

"It will hurt the public, much more than the owners of railways, to take away the incentive to increase railway systems and to upbuild and improve them. Capital can, of course, seek other fields, but the lack of interest in railways by the men of large means and large views will soon show itself in neglected equipment, perilous roadbeds and wretched operations. But the most portentous feature is the curb and restraint to be put upon initiative and ambition. Mr. Townsend's phrase is to the effect that no railway shall acquire the stock or property of any railway which competes with it; but as every carrier competes with every other carrier every conceivable acquisition is forbidden. For example, the Denver, Northwestern & Pacific, as part of a through route from Chicago to Steamboat Springs, formed in conjunction with the Burlington route, is in competition with the Rock Island as part of another through route from Chicago to Steamboat Springs. Hence, neither the Burlington nor the Rock Island must buy the Denver, Northwestern & Pacific, though it is a natural extension of each and in nowise parallels either. Again, the Louisville, Henderson & St. Louis, as part of a through route in conjunction with the Chesapeake & Ohio from Washington to Kansas City, competes with the Missouri, Kansas & Texas as part of another through route via the Baltimore & Ohio between the same points. Hence the 'Katy' must not purchase the Louisville, Henderson & St. Louis, though it is an obvious extension of its route and in no sense parallels it. The clause is so inclusive that no one can fortetell what, if any, limitations the courts will put upon its meaning. Were I advising a client, I should tell him the words could mean all that I have indicated.

"Even if the words finally enacted cover only lines that are both parallel and competing, I do not concede that the policy of such a law would be sound or wise. What we are working for is low rates and good service. If there are three parallel lines, for instance, the acquisition of one by another does not destroy competition as long as the third remains separate; and at the same time such acquisition will result in many economies that will tend to bring down rates on the detached third line. Economists, indeed, have long argued that compulsory combinations are the true remedy for our difficulties. By such a method, the public would be saved the expense of duplication of officers and of all elaborate machinery for soliciting and advertising for business. With the interstate commerce act still in force, fair and reasonable rates could still be adjudicated and enforced, and on a lower level because of the economies mentioned. Compulsory combination, or unrestricted right of combination, would be far more in keeping

with our American ideas than this new commandment, 'Thou shalt not enlarge thy business.'

"The several states granted charters to the railways. These charters are contracts, subject to amendment by the states, and only by the states. Many, if not most, of the powers granted by the states have no relation whatever to interstate commerce. They are as readily applicable to a corporation running a crossroads blacksmith shop. Among such powers are the power to acquire extensions and the power to emit and negotiate stocks and bonds. In the face of these well-known, firmly established facts, can it be that Congress intends to oust the several states from their exclusive control of these matters and announce a new universal policy in the making of which their legislatures shall have no voice? . . . Consider for a moment the investor. He has bought his investment in reliance upon a state statute. Whether he owns stocks or bonds, he hopes for an added margin of safety through growth in mileage and tonnage. Likewise he looks to the state to protect him from misuse of the right to negotiate securities. This proposed legislation will destroy all the things on which investors have relied, and will substitute rules that they did not choose. What has the federal government to do with the investor? If the avowed purpose of the law is to protect investors, then the statute will be unconstitutional from the outset.

"The proposed restrictions upon the issuance of stocks and bonds will not have the slightest effect in the direction of reducing rates. If they have any effect whatever it will be in the direction of raising rates. A rate never is, and probably never was, fixed by taking into account the capitalization of the corporation fixing the rate. I greatly doubt whether the principal traffic man of any important railway could correctly or even approximately state the securities that the railway has outstanding or the amount of such securities. I can guarantee that none of them ever considers the securities when trying to determine a rate on a given commodity from one point to another."

Mr. Walker here read an editorial on this subject from the *Railway Age Gazette* of February 4, and in closing said:

"As between shippers and carriers the carrier is the great conserving force. The carrier is the one thing that stands between the small dealer and the large monopoly or trust. Hence anything that can be done in the way of making rates fair to the shippers and to the carriers should be done, and it should be done by the federal government. But stocks and bonds are things for sale. They are commodities, and the federal government has no more business to fix a method of determining the rate at which those things should be sold than it has to fix the price, locally, of corn, or hides, or the product of the mines, or any other product that you can think of. I believe that the regulation of stocks and bonds will result in the increase of rates. Whateyer is done in the way of hampering railroads in their financing (which already is beset with many difficulties) will tend to force the weaker railways to the wall, and to bring about the acquisition of such lines by their connections. (I am assuming that the provisions against such acquisition will be interpreted in such a way as to permit the acquisition of non-parallel extensions.) This process, if carried to its logical limits, would shortly result in the centralization of all of the railways of the country in a very few hands, with the result that competition will be lulled to a minimum in many districts. If competition is removed, it can hardly be expected that the railway managers, in their desire to upbuild and maintain their properties and to show good returns upon the funds invested in them, will not raise rates when opportunities occur. It is my hope and expectation that your committee will conclude that there is no relation between the interstate commerce functions of a carrier, on the one hand, and its chartered rights on the other hand, and will refuse to report these features of the bill."

Cowards in Congress.

That the commerce of our times cannot be fitted to a box and fastened in by the carpentry of legislation is illustrated by every legislative act of the past two decades. Boxes are for dead men. You cannot put the living into them without killing the man or splitting the box. We have a box that we know ought to be torn apart. Nothing has ever fitted it nor ever will. To force the business of railways and commerce into the Sherman act would be to destroy every form of corporate business in the country, and yet we have a lot of cowards in Congress who do not dare touch that box. To them it is a veritable ark in the wilderness of confusion upon questions too great for them. So they bow down in idolatrous political worship of their anti-trust ark. They have taught the people to say amen. This shows me that our greatest men are not grappling with the tremendous questions of our material development. Either we have not men sufficient for their time with the creative power of the men of the earlier republic, or, if we have such men, the allurements of business or the misguided franchise has kept them out of legislative halls.—*Chancellor Day, of Syracuse University, in Leslie's.*

The Four Great Transcontinental Roads of the Northwest.

The *Wall Street Journal*, in its issue of February 3, publishes an interesting map of the four great railways of the Pacific Northwest, showing the branches under construction by the Chicago, Milwaukee & Puget Sound. A comparison of the earnings, market price of the stock, fixed charges, etc., of the Great Northern, the Northern Pacific, the Canadian Pacific and the Chicago, Milwaukee & St. Paul accompanies the map, and we reprint the table showing the figures for the four roads reduced to a per mile basis. The 700 miles of branch lines, however, of the St. Paul were not taken into consideration in preparing the table:

Year to October 31, 1909.

Per mile:	Can. Pac.	Gt. Nor.	Nor. Pac.	St. Paul.
Gross earnings	$8,200	$8,460	$12,660	$7,840
Net earnings	2,650	3,570	5,535	3,040
Operating ratio, per cent.	67	57	58	61
*Charges and taxes	$880	$692	$1,050	$733
Surplus	1,770	2,878	4,485	2,307
Dividends on pf. stock	213	†...	‡...	913
Balance for common	1,557	2,878	4,485	1,394
Common stock outstanding.	15,200	30,000	43,730	13,000
Earned on par, per cent.	12.4	9.5	10.3	10.7
§Market value stock	$27,300	$40,500	$51,160	$19,240
Earned on market value, per cent.	5.7	7.1	8.8	7.2

*Less other income.
†All Great Northern stock is one class, technically called preferred.
‡None.
§Canadian Pacific at 180, Great Northern at 135, Northern Pacific at 137 and St. Paul at 148.

Commerce Commissioners and Expansion.

A sympathetic critic of the *Wall Street Journal* takes exception to the following statement in the editorial columns of this paper of February 2:

"If new capital had been in the position of waiting for the authorization of a government commission, the United States would have ended at the 'Great American Desert.'"

He believes that the Interstate Commerce Commission is made up of Americans, who are, therefore, likely to be sympathetic with railway expansion and enterprise, even if undertaken at considerable risks.

This newspaper has been a consistent advocate of the regulation of railways. The only alternatives were unfettered monopoly or government ownership. With all due respect to the Interstate Commerce commissioners, it may be submitted that they are essentially human. At the outset they may imagine that the purpose of the commission is to regulate the railways. Later they lose sight of the fact that it is regulation which is essential, and not the commission. The commissioner, no doubt innocently and unconsciously, tends unduly to magnify his office. The railways may be doing all that efficient regulation requires, but the natural consequence is the stimulation of legislative activity which will expand the functions of the commission.

It need hardly be said that when we support regulation, we do not mean management. If the Interstate Commerce Commission is to take over the management of the railways, particularly in the matter of financing, who is to be responsible to the stockholders for mistakes? At present, the officers and directors of the roads are morally, financially and criminally responsible. What recourse is the stockholder to have where

the decisions of the management of his own selection have been overruled?

Mr. Taft's special message to Congress recommended that the authorization of the Interstate Commerce Commission should be required for the issue of new stock below par. A moment's reflection on the way our railway enterprises have often been financed will show what danger lurks in this recommendation. A railway whose stock is selling below par sees an opportunity, by offering liberal inducements to capital, to extend into a field not yet served or settled, but one which may attract dangerous competition. As it starts with nothing but a franchise and a right of way, it is obvious that the new stock, and even the bonds for a time, will constitute what is loosely called water. The Interstate Commerce Commission, objecting to water, prohibits the enterprise. Another and stronger railway, which need not ask permission because its stock is selling above par, builds into the territory in question and bankrupts the first road.

Who is to indemnify the ruined holder of the road's securities?—*Wall Street Journal.*

American Society of Civil Engineers.

At the meeting held on February 16 two papers were presented for discussion as follows: The Effect of Alkali on Concrete, by George Gray Anderson, M. Am. Soc. C. E.; and Precarious Expedients in Engineering Practice, by John Hawkesworth, Assoc. M. Am. Soc. C. E. Mr. Gray's paper was printed in Proceedings for December, 1909, and Mr. Hawkesworth's in the Proceedings for January, 1910.

Western Canada Railway Club.

At the regular monthly meeting held in the Royal Alexandra hotel, Winnipeg, Can., on Monday, February 11, a paper entitled The Evolution of Paint Manufacturing and Advantages of Standardizing in Railway Work, was read by W. S. Fallis, manager of the western branch of the Sherwin-Williams Co., Cleveland, Ohio.

Railway Storekeepers' Association.

The following subjects have been assigned for the seventh annual convention to be held at the Planters' Hotel, St. Louis, Mo., May 16-18, 1910.

G. 1. By What Unit of Measure is the Efficiency of a Storekeeper Properly Determined? H. C. Pearce, G. K. S., Southern Pacific, San Francisco, Cal., and C. H. Drazy, S. K., C. B. & Q., Aurora, Ill.

G. 2. Economy and Mechanical Contrivances for Handling Material. J. F. Slaughter, S. K., M. K. & T., Denison, Tex.

G. 3. Economy of the Piece Work System in the Handling of Supplies. D. C. Curtis, Piece Work Inspector, C. B. & Q., Chicago.

It is expected and the executive committee requests that every general storekeeper will have one of his storekeepers or store department men prepare an article on some one of the above subjects. Especial attention is called to subject G. 3., on piece work. This is a very interesting and important subject at this time, and it is hoped that it will bring out considerable discussion.

Railway Telegraph and Telephone Appliance Association.

At a meeting in New York, February 9, of representatives of manufacturers of telegraph and telephone apparatus and supplies, the Railway Telegraph and Telephone Appliance Association was organized, with the following officers: Chairman, P. W. Miller, Kerite Insulated Wire & Cable Co., 30 Church street, New York; vice-chairman, A. P. Eckert, National India Rubber Co., 42 Broadway, New York, and secretary and treasurer, Hiram M. Buck, Railroad Supply Co., 30 Church street, New York. The executive committee will be announced later.

The constitution and by-laws adopted by the association are very much like those of the Signal Appliance Association. The main object of the Railway Telegraph and Telephone Appliance Association is to provide an exhibition of appliances in connection with the annual meetings of the Railway Telegraph Superintendents' Association.

New York Railroad Club.

At the regular meeting held on Friday, February 18, F. J. Angier, of Galesburg, Ill., superintendent of timber preservation, C., B. & Q., will present a paper on The Seasoning and Preservative Treatment of Wooden Cross-ties.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.; May 10-13; Indianapolis.
AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; June, 1910; Niagara Falls, Ont.
AMERICAN ASSOC. OF LOCAL FREIGHT AGENTS' ASS'NS.—G. W. Dennison, Penna. Co., Toledo, Ohio.
AMERICAN ASS'N OF RAILROAD SUPERINTENDENTS.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; March 18; Chicago.
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—R. W. Pope, 33 West 39th St., N. Y.; 2d Friday in month; New York; March 30-April 1; Charlotte, N. C
AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York; May 18; New York.
AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—S. F. Patterson, B. & M., Concord, N. H.
AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago, March 14-17, 1910; Chicago.
AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.
AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia
AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; New York.
AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—B. V. Swenson, 29 W. 39th St., New York.
ASSOCIATION OF AM. RY. ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May 25-27; Chattanooga, Tenn.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wisconsin Central Ry., Chicago; May 16-20, 1910; Los Angeles.
ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Place, N. Y.
BUFFALO TRANSPORTATION CLUB.—J. N. Sells, Buffalo.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., N. Y.; May 24-27; Niagara Falls, Ont.
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; May 23-26; Chicago.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; May; Cincinnati.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
NORTH-WEST RAILWAY CLUB.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
NORTHERN RAILWAY CLUB.—Fourth Saturday in month; Duluth, Minn.
OMAHA RAILWAY CLUB.—A. H. Christiansen, Barker Blk.; 2d Wednesday in month.
RAILROAD CLUB OF KANSAS CITY.—Third Friday in month; Kansas City.
RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.
RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C., Collinwood, Ohio; May 16-18; St. Louis.
RAILWAY TELEGRAPH AND TELEPHONE APPLIANCE ASS'N.—H. M. Buck, Secy.-Treas., 30 Church street, New York.
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Norquist, Chicago.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—J. H. O'Donnell, Bogalusa, La.
SOUTHERN & SOUTHWESTERN RY. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.
TRAFFIC CLUB OF NEW YORK.—C. A. Swope
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R. R., East Buffalo, N. Y.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Traffic News.

The state railway commission of Nevada announces that the Wells-Fargo Express Co. has agreed to make a general reduction of its rates in that state.

Shipments of anthracite coal for the month of January aggregated 5,306,618 tons, which is 223,273 more than in January of the previous year. The Reading, the Lackawanna and the Pennsylvania show large increases, and all other roads decreases.

The publicity committee of the Traffic Club, of Chicago, has issued an attractive booklet regarding this club, and particularly regarding its quarters in the La Salle Hotel. The booklet is illustrated by eight photographs of the interior of the club and of views from its windows.

The Wisconsin State Railway Commission is investigating charges that the Chicago & Northwestern, the Chicago, St. Paul, Minneapolis & Omaha, the Minneapolis, St. Paul & Sault Ste. Marie, the Chicago, Milwaukee & St. Paul, and the Green Bay & Western are not furnishing sufficient cars for shippers.

The New York, Ontario & Western has filed with the Interstate Commerce Commission its new freight tariffs from New York to the West, based on a rate of 75 cents first-class to Chicago. They go into effect March 15, and the Lackawanna and the Erie have withdrawn their notices of a proposed reduction.

R. R. Darwin, rate expert of the Michigan Railway Commission, in a memorandum filed with the Commission, says that of 1855 freight tariffs and supplements applying to rates on staple commodities which were filed with the railway commission during 1909, 83 per cent. contained reductions and 17 per cent. advances in rates.

It is given out in Philadelphia that the cities of Boston, New York, Philadelphia, Baltimore and Richmond will jointly establish a traffic bureau, the chamber of commerce or other prominent commercial body of each city appointing two representatives, and it is said that N. B. Kelly, freight commissioner of the Philadelphia chamber of commerce, will probably head the new bureau.

Several conferences which have been held by railway traffic men and lumber shippers of the Northwest on the subject of the transit privilege on lumber have failed to result in agreement, and it has been decided to leave the settlement of the questions involved to the Interstate Commerce Commission. The railways now grant the right of diverting shipments at certain transfer and storage points on the original waybill. The jobbers of lumber insist that this privilege shall not be abolished, while the manufacturers of lumber seek its abolition on the ground that it gives entire control of the lnmber retail trade to the jobbers. The railways were unwilling to decide between these conflicting elements.

Resolutions have been introduced in both houses of the Oklahoma legislature condemning Judge Hook, of the federal court, for issuing injunctions restraining the enforcement of the 2-cent fare provision of the Oklahoma constitution and freight rate orders issued by the State Corporation Commission. The tenor of these resolutions and the apparent sentiment of most of the legislature were expressed by Representative Wortman, of Claremore, in a speech in the House, in which he said that he hoped the time would come when federal judges would place the interests of the people above the interests of property and would allow the will of the millions to prevail in the fixing of railway rates. Besides the resolution denouncing the action of Judge Hook a resolution was introduced in the Senate favoring an amendment to the federal constitution to make federal judges elective.

Freight Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 62, covering car balance and performance for August, 1909, says:

"With 8.72 per cent. of the total cars reported in the surplus

Freight Car Balance and Performance in August, 1909.

	New England.	New York, New Jersey, Del., Md., Eastern Pa.	Ohio, Indiana, Mich., Western Pa.	Virginia, W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minnesota.	Montana, Wyo., Neb., Dakotas.	Kansas, Colo., Oklahoma, Mo., Ark.	Texas, Louisiana, N. Mex.	Oregon, Idaho, Nev., Cal., Arizona.	Canadian Lines.	Grand total.
Revenue freight cars owned	75,246	664,841	198,073	165,177	169,819	374,748	16,794	131,213	27,540	115,232	99,308	2,037,991
Average number system cars on line	53,736	459,686	146,429	112,701	119,811	297,278	7,181	90,594	16,063	65,954	82,780	1,452,213
Railroad-owned cars: Av. foreign on line	25,101	174,288	58,865	34,222	37,228	91,136	12,164	43,735	18,913	47,788	15,153	558,610
Total cars on line	78,837	633,974	205,294	146,923	157,039	388,414	19,345	134,329	34,993	113,742	97,933	2,010,823
Excess	3,591	.....	7,221	.....	.....	13,666	2,551	3,116	7,453	.....	.....	.....
Per cent. cars on line to total owned:												
Home	72	69	74	68	70	80	43	69	58	57	84	71
Foreign	33	26	30	21	22	24	72	33	69	42	15	28
All railroads	105	95	104	89	92	104	115	102	127	99	99	99
Private cars on line	3,277	38,927	8,333	1,960	6,020	16,751	1,769	8,481	1,886	7,335	3,325	98,064
Total, all cars on line	82,114	672,901	213,627	148,883	163,059	405,165	21,114	142,783	36,879	121,077	101,258	2,108,887
Per cent. of cars in shop	6.67	7.46	7.92	8.44	9.87	6.41	5.19	13.13	6.62	6.54	11.47	7.89
No. of freight engines owned	1,108	10,011	2,588	2,964	2,522	6,221	459	2,506	757	2,340	2,107	33,583
Av. cars on line per freight engine owned	74	67	83	50	65	65	46	57	49	52	48	63
Total freight-car mileage	42,310,346	489,284,076	138,270,134	110,470,758	110,751,802	295,694,462	28,766,725	90,844,810	27,987,177	111,641,991	74,243,015	1,520,265,296
Average miles per car per day	16.6	23.1	20.9	23.9	21.9	23.7	43.9	21.5	24.5	29.7	23.7	23.2
Per cent. loaded mileage	72.3	68.2	69.8	65.5	71.4	72.3	72.3	71.8	69.7	72.4	73.2	70.1
Ton-miles of freight, inc. Co. freight	431,046,040	7,492,362,886	2,066,459,101	1,711,754,007	1,530,023,839	2,489,236,539	416,894,981	1,292,412,536	316,744,430	1,559,115,382	932,533,697	20,238,583,438
Average ton-miles, including Co. freight:												
Per car-mile	10.2	15.6	16.6	15.5	13.9	13.5	15.0	14.2	12.5	14.2	12.6	14.6
Per loaded car-mile	14.1	22.8	23.7	23.6	19.55	18.8	20.7	19.9	18.3	19.6	17.2	21.0
Per car per day	169	359	356	371	304	301	706	305	292	420	297	340
Gross freight earnings	$5,272,933	$45,039,951	$12,723,981	$9,608,674	$9,936,520	$21,794,477	$3,372,907	$10,957,889	$3,333,667	$14,213,429	$6,585,213	$142,789,641
Average daily earnings: Per car owned	$2.26	$2.19	$2.07	$1.88	$1.90	$2.41	$6.49	$2.69	$3.90	$4.04	$2.12	$2.36
Per railroad-owned car on line	2.16	2.30	2.00	2.11	2.05	2.35	5.63	2.63	3.07	4.16	2.15	2.40
All cars on line	2.07	2.16	1.92	2.08	1.98	2.23	5.16	2.48	2.92	3.91	2.08	2.29

column, and with 'excess' shop cars equalling 2.87 per cent. of the total, the general averages for performance compared quite favorably with net averages for the earlier months of 1908. Deducting the idle equipment, the averages are quite satisfactory, and indicate a marked improvement over the performance for the same month in 1908. The regular comparative summary follows:

	Average miles per day.		Average ton-miles per car per day.		Average earnings per car per day.	
	Inc. surp. cars.	Exc. surp. cars.	Inc. surp. cars.	Exc. surp. cars.	Inc. surp. cars.	Exc. surp. cars.
December, 1907.	21.9	23.9	289	316	$1.98	$2.17
January, 1908.	20.8	24.9	277	325	1.81	2.17
February, 1908.	19.7	23.8	271	328	1.82	2.20
March, 1908...	21.2	25.5	290	348	1.95	2.34
April, 1908....	19.6	24.5	258	324	1.83	2.29
May, 1908.....	19.3	24.8	254	329	1.72	2.22
June, 1908 ...	19.6	24.7	276	347	1.88	2.37
July, 1908.....	20.0	24.8	275	342	1.84	2.26
August, 1908..	20.8	25.1	292	354	1.98	2.40
September, 1908	22.0	25.2	320	367	2.24	2.57
October, 1908..	23.8	25.9	346	376	2.33	2.54
November, 1908	23.5	25.8	341	375	2.32	2.55
December, 1908	22.3	25.2	332	376	2.16	2.45
January, 1909.	20.9	25.3	293	354	1.98	2.39
February, 1909	21.7	25.9	306	365	2.04	2.43
March, 1909 ..	22.7	27.2	330	393	2.19	2.61
April, 1909.....	22.4	26.8	310	371	2.13	2.54
May, 1909.....	22.5	26.8	304	362	2.05	2.45
June, 1909.....	22.4	26.5	314	371	2.13	2.52
July, 1909	22.0	25.8	309	362	2.09	2.45
August, 1909..	23.2	26.3	340	384	2.29	2.59

"There was an active outward movement of cars, the home cars dropping from 74 per cent. in July to 71 per cent. in August. The loaded mileage increased from 68.3 per cent. to 70.1 per cent., which is the highest average reached since November, 1907, with the exception of October, 1908. The shop percentage again shows a decrease that brings it down to 7.89 per cent., an excess of only 2.87 per cent. over the normal.

"The tons per loaded car average 21.0, an increase of .3 tons over July."

The accompanying table gives car balance and performance for the period covered by the report.

Annual Dinner of Traffic Club of Chicago.

Oscar F. Bell, the president, presided at the annual dinner of the Traffic Club of Chicago on February 8. Frank B. Montgomery was toastmaster. Senator Cummins, whose remarks were partly reported last week, criticized the method of basing rates on what the traffic will bear; he believes that the only fair way to make rates is on the basis of cost of service. He does not favor a valuation of railways. Assuming the present gross capitalization of American railways at sixteen billions, he was sure that a valuation based on the cost of physical reproduction would amount to twenty billions. He contended, nevertheless, that the railways are overcapitalized to the extent of at least six billions.

Edgar A. Bancroft, general counsel of the International Harvester Company, in his talk on "Co-operation and Its Dangers," said that one of the greatest dangers to the country is the growth of group consciousness and group morals. The moral code of a group of men, he said, is always lower than the moral code of any individual composing it. Men organized in corporations or trade unions will commit acts which each of them would condemn as wrong if done by an individual. To the solution of the great economic and industrial problems of this country it is essential, he said, that we should cease to substitute group morals for individual morals and that we should recognize the fact that an act which it is wrong for one man to do is just as wrong for any number of men to do.

Warren J. Lynch's facetious address on the subject of "A Statistical Elaboration of the Fundamental Principles of Practical Rate-Making" did not deal with rate-making, either practical or otherwise.

Union Pacific Merger Hearing.

On Tuesday Harriman officials began the submission of evidence to show that the government's case against Union Pacific is without foundation. Hearings are held at the New York Customs House before Judge Sylvester G. Williams, of Denver, the special examiner appointed by the United States Circuit Court, eighth district, before which the suit was instituted.

Testimony for the railway must be concluded by April 1, after which the government may present evidence in rebuttal.

Attorney-General Bonaparte instituted the present proceedings on Jan. 27, 1908, by filing a bill in equity before the United States Circuit Court at Salt Lake City, to set aside control by the Union Pacific and its subsidiaries of the Southern Pacific and the San Pedro, Los Angeles & Salt Lake. On June 30, 1909, the Oregon Short Line owned $124,200,000 S. P. stock, and $4,760,000 S. P. convertibles, or 38.75 per cent. of the securities of the company with actual or latent voting power, and $12,500,000 or 50 per cent. of the stock of the Salt Lake line. The suit to compel the disposal of these securities resulted from testimony taken during the investigation into Harriman affairs begun Jan. 4, 1907.

Mr. Stubbs was the first witness called, Counsel Dunne examining. Mr. Stubbs said that he had been engaged in railroading in an official capacity since 1869. In 1872 he was made general traffic manager of the Central Pacific. In 1901 he became director of traffic for the Union as well as the Southern Pacific.

Mr. Stubbs traced the development of the various transcontinentals, Union Pacific being joined with Central Pacific at Promontory Point, May 9, 1869. The Southern Pacific's through line to New Orleans was connected up in 1883. In 1885 the lease of the Mojave to the Needles division of the Southern Pacific was made to the Atchison, giving it a through line to San Bernardino. By 1900 Atchison had acquired a right of way over the Southern Pacific's subsidiary, the San Joaquin Valley Railroad, to Stockton, and constructed its own line from Stockton to San Francisco. Canadian Pacific was completed to Vancouver in 1887.

Previous to the opening of the Central Pacific in 1869 trans-

REVENUES AND EXPENSES OF EXPRESS COMPANIES.

FOR THE MONTH OF OCTOBER, 1909.

Name of company.	Adams Express.	American Express.	Canadian Express.	Can. Nor. Express.	Globe Express.	Great Nor. Express.	National Express.	Northern Express.	Pacific Express.	Southern Express.	United States Express.	Wells, Fargo & Co.	Western Express
Mileage of all lines covered: Rail lines....	30,958	46,205	7,078	3,164	1,900	7,232	1,094	6,497	22,106	31,162	23,894	56,413	3,452
Other lines	3,488	1,820	2,792	22	.....	211	292	261	608	2,995	611	4,844	4
Operating revenues:													
Express	$2,857,130	$3,071,351	$218,625	$33,031	$53,960	$216,895	$96,208	$307,049	$766,468	1,167,363	$1,491,713	$2,452,601	$64,796
Misc. transportation..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	171	183
Nontransportation	15,617	119,151	4,280	1,651	471	1,289	416	5,660	11,391	15,644	21,877	45,151	1,111
T'l receipts, operation.	2,872,747	3,190,502	222,905	34,682	54,431	218,184	96,624	312,708	777,859	1,183,007	1,513,591	2,497,924	66,091
Exprs. privileges—Dr..	1,479,867	1,476,861	109,022	13,005	27,074	87,809	36,816	149,357	376,584	556,849	686,294	1,182,680	29,420
Total	$1,392,880	$1,713,642	$113,883	$21,677	$27,358	$130,375	$59,808	$163,351	$401,274	$626,157	$827,296	$1,315,243	$36,671
Operating expenses:													
Maintenance	$78,617	$138,838	$1,451	$100	$263	$1,300	$757	$3,012	$11,791	$24,635	$47,923	$68,462	$413
Traffic	7,676	19,093	1,254	122	946	946	.....	1,743	6,478	6,027	12,929	15,149	842
Transportation	925,274	1,143,409	75,341	9,588	14,210	62,025	44,747	74,181	212,676	365,554	605,128	820,209	18,896
General	63,137	104,325	6,880	1,338	2,610	3,156	2,835	5,939	15,660	44,545	41,451	59,562	1,713
Total	$1,074,703	$1,405,666	$84,926	$11,147	$18,028	$67,427	$48,340	$84,874	$246,606	$440,759	$707,431	$963,382	$21,864
Net operat'g rev. or def.	$318,177	$307,976	$28,957	$10,529	$9,330	$62,948	$11,468	$78,477	$154,669	$185,398	$119,865	$351,861	$14,806
Taxes	15,124	70,831	1,150	130	550	3,191	3	3,500	4,948	9,878	5,011	16,577	461
Operating inc. or loss...	$303,053	$237,145	$27,807	$10,399	$8,780	$59,757	$11,465	$74,977	$149,721	$175,510	$114,854	$335,284	$14,345

Per railroad-owned car on line.....
All cars on line.....

portation to the coast was by clipper ships around the Horn, or over the Panama Railroad. The considerable difference in rates via Cape Horn and via the Isthmus led merchants to ship all goods that were possible via the Horn. Freight service via Panama required on the average 45 days, passenger service 26 days. By way of the Horn, Atlantic-Pacific traffic consumed from 90 to 180 days. This required carrying large stocks by merchants, six months' supply being on the sea.

When the Central-Union Pacific was first opened the transcontinental rate was $8 per 100 lbs. Because of the indisposition of a merchant to change his custom the railway had difficulty in securing business. The rate in 1870 was reduced to $6 per 100 lbs.

In 1877 railways proposed the contract system, a lower all-rail rate being offered for the guarantee of the business of the individual merchant for one year. At first different rates were given to different shippers. This system induced all but one of the important merchants on the coast to give the railways their business in 1878. After this first year under the contract plan the rates were harmonized and published. Development of manufacturing in the West reduced the sharpness of water competition, and the railway was gradually gaining ground.

Mr. Stubbs testified that the "Sunset Route" between New York and San Francisco over the Southern Pacific was opened in February, 1883. Owing to the bad service offered by the all-rail routes and dissatisfaction among merchants with the contract rate plan, the time was propitious for the opening of a rail and water route under one control. As against 45 days sometimes required by the all-rail line, the "Sunset Route" carried traffic from New York to San Francisco in 18 days, which was then remarkable time. Moreover, overcharges and damage claims were settled promptly, and the merchants on both coasts were glad to send their goods over the "Sunset Route."

Asked what was the effect of the unity of management on the "Sunset Route" as against the diversity of management on the all-rail lines, Mr. Stubbs said that on the all-rail lines damage claim settlement, for instance, required six months, as against immediate settlement by the Sunset. From 1870 to the opening of Atchison's own line the matter of California rates was determined by the Central Pacific. Mr. Stubbs said that there had been no time since 1881 when any California all-rail rates were made without consent of the Central Pacific when proposed and the Santa Fe on the advent of the rates.

Witness brought out the point that the Union Pacific, together with the Oregon Short Line and Oregon Railroad & Navigation Co and the latter's steamship line from Portland to San Francisco had never been anything but a paper route, because it was unable to carry California traffic at rates perfectly practical for the Central Pacific. Mr. Stubbs said that the completion of the Great Northern and Northern Pacific had no appreciable effect on the California business of the Southern Pacific, which, since 1885, had controlled the Central Pacific through a 99-year lease. Canadian Pacific once established a 10 per cent. differential on California business, but withdrew it after incurring considerable losses.

Mr. Stubbs brought out the fact that the Union Pacific has been only an intermediate line, with no way into California from Ogden or Portland save over the Central Pacific and the Southern Pacific or Atchison rails; also that the distance from Ogden to Portland over Union Pacific's affiliated lines is greater than from Ogden to San Francisco; that Ogden traffic for San Francisco, via Portland, would require four or five days more than over the Central Pacific, aside from any question of extra handling and damage to goods. Witness said that no shipper to California points would use the Union Pacific to California route, via Portland, except in return for inducements which could not be made, as the route via Portland was obviously at a disadvantage as regards cost of haul.

Mr. Stubbs stated that never since he had been connected with the Central Pacific in 1870 had he had any reason to pay attention to competition on part of the Union Pacific for California business via the Portland gateway simply because that was an unprofitable route and no attempt was made by Union Pacific to employ it.

At this point witness called attention to the fact that while Union Pacific had only the Central Pacific as an outlet to California points, the Southern Pacific had at Ogden an eastern connection in the Denver & Rio Grande, to which the Southern Pacific could have deflected all of its business, and that undoubtedly it would have done so had Union Pacific tried to use a steamship line from Portland to San Francisco to divert business from the Central Pacific. Mr. Stubbs stated Union Pacific officers recognized the costliness of such a move too well ever to attempt or think of attempting such diversion. Mr. Stubbs said that the amount of Missouri River or through traffic filtering through Portland to San Francisco from Canadian Pacific, Great Northern and Northern Pacific is so small as to indicate that traffic managers of these lines do not go after this business with enthusiasm, obviously because of the realization that they have not a practical route to the California ports.

In 1895 Southern Pacific carried 79 per cent. of the traffic to Western coast points. By 1901 the proportion had fallen to 39 per cent., caused only partially by falling off in the Sunset's tonnage, chiefly because of the increase in the business carried by roads to the Northwest, due to the development there.

After the recess Mr. Stubbs continued his testimony, stating that for the year ended June 30, 1901, Oriental traffic amounted to about 34,000 tons. Union and Southern Pacific's earnings from this traffic for that year were about $375,000. In his opinion the importance of Oriental traffic has always been overrated.

Union and Southern Pacific organized the Occidental & Oriental Steamship Co. to carry business to and from San Francisco, each owning a half interest. At that time Southern Pacific had no interest in the Pacific Mail Steamship Co. Although Union and Southern Pacific were thus jointly interested in a through line from the Missouri River to the Orient prior to 1901, the Union Pacific constantly worked the Portland route preferentially.

In 1901 the Portland & Asiatic Steamship Co. initiated a service to the Orient to care for the flour business to Portland over the Union Pacific. Without this service Puget Sound would have received this traffic over the Northern Pacific. Earnings of the Portland & Asiatic Steamship Co. have never paid cost of operation, save during the year of the Russo-Japanese war. Inward-bound Asiatic business, so far as Portland is concerned, moved almost wholly through San Francisco over the Central and Union Pacific.

At the continuation of the hearing on Wednesday, Vice-President J. C. Stubbs was recalled to the stand. Comparing westbound Asiatic traffic via Union Pacific through Portland and via the Sunset Route, the witness stated that for the year ended June 30, 1901, this traffic over the Union Pacific amounted to 262 tons, and via the Sunset Route for the year ended June 30, 1900, the 1901 records having been destroyed in the San Francisco fire, was 1,098 tons. Mr. Stubbs brought out the fact that before the so-called merger of the Union and Southern Pacific transportation business between San Francisco and Portland was non-competitive, because the Southern Pacific found after opening the "Shasta Route" it could not take this business from the steamship lines operated by the O. R. & N. In the year ended June 30, 1901, the latter company's business between these cities amounted to 76,700 tons, as against 25,879 tons over the Shasta Route.

With reference to the alleged competitive business between Atlantic ports and Utah and Colorado points, witness brought out the fact that Southern Pacific had never been an active competitor with Union Pacific for this business, its line to the points being 270 miles longer than Union's. On cross-examination by Mr. Severance, Mr. Stubbs insisted that any competition entered into by the Southern Pacific was with lines east of the Missouri river, not with Union Pacific. Mr. Severance asked whether before 1901 Union and Southern Pacific were soliciting eastern business for Utah and Colorado points each for itself. Mr. Stubbs replied that they were.

Defining his use of the term "competition" as used in all of his testimony, Mr. Stubbs stated that he referred to competition which is in restraint of trade. On direct examination by Mr. Dunne, Mr. Stubbs testified that the business of the steamship lines between San Francisco and Portland had in no wise been affected by the heavy traffic over the Shasta Route, and that the railway would have advertised the Shasta Route in the same way had there been no steamship service. In other words, the Shasta line had created its traffic.

REVENUES AND EXPENSES OF RAILWAYS.
MONTH OF DECEMBER, 1909.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF DECEMBER, 1909.

(See also issues of February 4 and 11.)

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Alabama Great Southern	309	$233,935	$99,440	$370,268	$51,738	$67,269	$9,278	$107,849	$8,913	$245,047	$125,221	—$639	$11,236	$113,346	$34,345
Atlanta, Birmingham & Atlantic	641	161,014	53,668	228,645	24,657	36,100	13,308	84,325	9,106	167,496	61,149	.....	13,832	47,317	13,137
Baltimore & Ohio	4,198*	5,281,481	1,127,564	6,836,786	843,688	1,371,004	147,956	2,462,555	127,827	4,953,030	1,883,756	—40,429	221,800	1,621,527	—158,038
Chicago, Indianapolis & Louisville	616	312,007	110,489	462,197	58,734	64,560	12,493	165,311	14,734	315,832	146,365	.....	20,500	125,865	44,830
Chicago, Indiana & Southern	341	298,129	20,618	325,934	27,179	70,125	6,442	108,872	8,709	221,327	104,607	—259	12,003	92,345	2,858
Chicago, Rock Island & Gulf	529†	176,045	64,109	253,737	70,298	17,741	5,956	103,975	8,617	206,587	47,150	—237	3,340	43,573	—69,064
Cincinnati, New Orleans & Tex. Pac.	337	580,464	137,046	757,836	69,052	139,564	20,093	214,109	17,766	460,584	296,252	—760	20,000	276,492	64,460
Cleve., Cin., Chicago & St. Louis	1,982	1,597,811	616,081	2,438,616	254,356	508,799	85,574	977,791	52,149	1,878,669	559,947	—8,969	64,328	486,650	225,782
Denver & Rio Grande	2,553	1,383,340	348,528	1,815,330	183,403	372,146	38,239	693,894	48,646	1,336,328	479,002	—5,266	71,000	402,736	—48,898
Florida East Coast	583	150,599	93,678	273,816	37,309	39,185	3,918	85,523	12,365	178,300	95,516	.....	11,544	83,971	12,990
Galveston, Harrisburg & San Antonio	1,338	666,109	221,715	933,753	124,814	136,569	29,364	338,473	76,985	656,205	277,048	—1,058	36,813	239,175	—73,563
Grand Rapids & Indiana	587	299,830	117,865	447,839	54,884	68,588	11,026	168,662	13,500	316,660	131,179	—2,387	21,413	107,379	50,613
Houston & Texas Central	789	329,846	129,634	494,376	61,214	64,776	17,005	191,353	20,059	354,408	139,969	.....	16,221	123,748	—34,302
International & Great Northern	1,159	533,278	185,146	767,441	99,321	109,024	18,685	334,144	21,200	582,374	185,067	.....	22,000	163,067	—24,476
Lake Erie & Western	886	407,000	65,480	495,209	41,268	92,782	11,730	176,520	11,621	333,921	161,288	.....	18,632	142 656	80 060
Lake Shore & Michigan Southern	1,663‡	2,608,595	908,926	3,979,469	306,378	733,218	112,718	1,397,794	73,123	2,623,231	1,356,238	—8,307	83,905	1,264,026	124,446
Long Island	391	241,572	350,598	626,545	36,625	84,346	11,953	334,083	19,664	486,671	139,874	64,147	33,232	170,789	95 239
Morgan's La. & Tex. R. R. & S. S. Co.	358	438,072	115,031	578,493	56,254	48,677	11,090	173,753	13,180	302,953	275,540	874	26,520	249,895	13,831
New York Central & Hudson River	3,587	4,786,769	2,247,519	7,931,957	815,649	1,377,145	182,741	3,105,096	173,643	5,654,274	2,277,683	53,520	294,627	2,036,576	778,400
New York, Chicago & St. Louis	558	823,309	103,303	958,333	75,590	86,925	47,589	365,115	13,875	589,094	369,239	—1,699	33,109	334,431	28,499
Northwestern Pacific	376	89,368	101,071	210,752	41,358	29,503	2,970	85,217	10,547	169,595	41,157	.....	10,988	30,169	14.666
Oregon R. R. & Nav. Co.	1,476§	822,488	299,998	1,195,562	115,350	175,317	28,844	427,068	41,218	787,797	407,765	838	92,992	315,611	—158,160
Oregon Short Line	1,508‡	1,183,290	383,979	1,660,373	150,838	213,772	36,387	411,731	37,175	849,903	810,470	—3,657	115,952	690,861	—172,637
Peoria & Eastern	351	202,011	61,195	283,411	25,495	61,849	5,300	100,205	5,417	198,266	85,145	.....	7,794	77,351	19,082
Pittsburgh & Lake Erie	191	1,215,389	123,917	1,379,791	134,775	123,773	13,096	353,038	22,573	647,255	732,536	—361	15,636	716,539	321,010
Rutland	468	131,900	79,904	240,700	19,725	42,147	6,061	107,716	8,091	183,740	56,960	.....	10,159	46,801	19,538
San Antonio & Aransas Pass	727	223,878	87,712	330,929	61,002	39,433	4,738	134,482	8,876	248,531	82,398	.....	9,000	73,398	—10,373
San Pedro, Los Angeles & Salt Lake	1,105	350,234	236,764	631,596	80,473	112,119	30,629	242,417	17,390	483,029	148,567	—7,247	20,443	120,878	—60.178
Seaboard Air Line	2,997	1,169,728	414,416	1,746,036	214,593	241,021	60.281	551,363	46,128	1,113,386	632,650	—3,293	59,418	569,939	100,134
Southern Pacific Co.—Pacific System	6,060°	4,695,111	2,439,638	7,622,607	1,059,381	1,046,286	156,965	2,045,021	222,273	4,529,926	3,092,681	—25,861	240,062	2,826,758	122,733
Texas & New Orleans	458	203,956	86,452	308,931	47,669	55,884	9,017	119,380	8,530	240,480	68,451	1,501	18,295	51,657	—8,451
Toledo & Ohio Central	441	290,398	48,387	351,310	47,464	65,258	6,348	126,081	7,263	252,415	98,895	—340	15,315	83.240	51.647
Trinity & Brazos Valley	455♁	192,569	23,989	220,870	33,417	25,774	6,259	95,393	13,904	174,747	46,123	.....	603	45,520	—3,541
Union Pacific	3,384△	2,835,567	836,450	4,038,872	361,038	600,547	113,443	1,203,053	110,927	2,389,008	1,649,864	—4,919	167,151	1,477,794	—384,680
Wabash	2,514	1,623,875	533,010	2,345,847	275,141	235,043	75,470	979,101	78,888	1,743,643	602,204	—1,751	64,495	535,958	10,457
Wheeling & Lake Erie	458✪	467,790	47,859	554,112	52,477	107,531	6,846	208,686	12,182	387,722	166,390	7,361	22,541	151,209	69,232
SIX MONTHS OF FISCAL YEAR.															
Alabama Great Southern	309	$1,300,653	$547,648	$2,023,955	$245,362	$486,717	$53,477	$578,171	$53,487	$1,417,214	$606,741	—$2,994	$67,416	$536,331	$89,017
Atlanta, Birmingham & Atlantic	641	947,769	283,049	1,300,517	155,168	199,298	71,484	492,569	52,811	971,329	329,188	.....	63,265	265,923	43,083
Baltimore & Ohio	4,198*	34,268,039	7,462,785	44,070,619	5,674,871	7,895,971	892,832	13,951,824	769,733	29,185,231	14,885,388	—312,811	1,132,714	13,439,863	1,374,567
Chicago, Indianapolis & Louisville	616	2,043,063	773,524	3,065,893	406,122	395,806	80,232	931,354	87,117	1,900,631	1,165,262	.....	121,500	1,043,762	295,303
Chicago, Indiana & Southern	341	1,609,122	146,353	1,796,630	292,444	313,635	50,122	582,531	48,637	1,287,369	509,261	389	74,503	435,147	171,483
Chicago, Rock Island & Gulf	529†	1,154,646	389,401	1,620,923	270,803	111,693	36,306	562,950	52,195	1,033,947	586,976	—1,510	31,223	554,243	211,225
Cincinnati, New Orleans & Tex. Pac.	337	3,438,757	787,057	4,442,592	503,590	852,199	115,589	1,210,631	105,377	2,787,386	1,655,206	84	120,000	1,535,290	374,027
Cleve., Cin., Chicago & St. Louis	1,982	9,814,775	4,018,641	15,149,717	1,747,073	2,438,116	486,263	5,325,733	275,907	10,273,092	4,876,625	—30,807	434,328	4,411,490	1,134,845
Denver & Rio Grande	2,553	8,768,178	3,082,601	12,370,776	1,498,707	1,915,803	252,379	4,232,894	276,165	8,175,948	4,194,828	33,772	405,000	3,823,600	341,281
Florida East Coast	583	614,134	389,051	1,156,393	194,815	216,531	24,514	460,870	51,554	948,284	208,109	.....	69,267	138,842	203,993
Galveston, Harrisburg & San Antonio	1,338	3,902,829	1,273,438	5,439,983	676,262	757,521	145,725	1,945,870	162,417	3,687,795	1,752,188	—18,093	177,708	1,556,387	—54,093
Grand Rapids & Indiana	587	1,530,527	964,916	2,668,065	307,561	401,748	66,439	997,274	80,308	1,853,330	814,735	—3,068	126,385	685,281	23.292
Houston & Texas Central	789	2,245,695	789,209	3,233,512	379,314	329,135	104,618	1,133,050	116,564	2,062,681	1,170,831	.....	83,698	1,087,133	33,883
International & Great Northern	1,159	3,236,226	1,021,962	4,530,404	754,836	688,881	110,470	1,776,151	126,642	3,456,980	1,073,424	.....	128,000	945,424	—109,033
Lake Erie & Western	886	2,257,702	476,257	2,876,647	403,364	486,256	74,867	955,070	60,805	1,980,363	896,284	.....	110,344	785,940	335,103
Lake Shore & Michigan Southern	1,663‡	16,379,760	5,809,031	24,865,888	3,124,086	3,549,092	603,923	7,240,257	367,655	14,885,013	9,980,875	—39,324	708,905	9,232,646	1,759,933
Long Island	391	1,592,484	3,261,615	5,080,386	457,369	609,042	96,802	1,997,129	108,881	3,269,223	1,811,163	530,600	199,394	2,142,369	583,165
Morgan's La. & Tex. R. R. & S. S. Co.	358	1,879,914	574,340	2,585,771	317,663	289,099	60,964	864,519	76,442	1,608,687	977,084	—4,683	106,520	865,881	164,099
New York Central & Hudson River	3,587	28,968,234	16,047,969	50,112,991	6,498,093	7,913,862	1,249,400	17,032,142	989,221	33,682,718	16,430,273	195,676	2,246,543	14,379,406	2,806,316
New York, Chicago & St. Louis	558	4,410,684	811,804	5,404,733	455,918	540,285	287,395	1,946,440	81,153	3,311,191	2,093,542	—6,499	198,109	1,888,934	448,284
Northwestern Pacific	376	726,905	888,412	1,744,459	292,298	195,483	15,924	572,101	57,840	1,133,647	610,812	.....	63,893	546,919	108,268
Oregon R. R. & Nav. Co.	1,476§	5,113,268	2,438,145	7,982,928	802,704	632,806	183,604	2,327,814	198,880	4,145,808	3,837,120	10,630	353,944	3,493,806	—85,553
Oregon Short Line	1,508‡	7,290,825	2,913,409	10,783,330	1,076,986	887,580	150,036	2,143,373	188,839	4,446,814	6,336,516	9,970	365,952	5,980,535	672,751
Peoria & Eastern	351	1,191,259	382,344	1,690,503	191,356	288,204	32,084	571,058	30,306	1,113,008	577,495	.....	51,794	525,701	125,601
Pittsburgh & Lake Erie	191	8,048,317	782,158	9,056,305	846,322	676,765	82,703	1,806,476	122,222	3,534,488	5,521,817	—1,986	98,636	5,421,195	2,195,155
Rutland	468	927,127	631,055	1,732,377	253,515	232,911	39,413	592,790	34,798	1,153,427	578,950	.....	61,051	517,899	100,450
San Antonio & Aransas Pass	727	1,486,307	543,926	2,138,739	304,965	254,273	27,360	760,487	53,111	1,400,196	738,543	.....	54,000	684,543	—47,778
San Pedro, Los Angeles & Salt Lake	1,105	2,255,946	1,590,343	4,100,842	641.924	625,742	171,006	1,310,719	99,132	2,848,523	1,252,319	—14,412	152,767	1,085,140	184,001
Seaboard Air Line	2,997	6,558,257	2,079,787	9,507,302	1,337,224	1,294,318	335,703	2,978,837	305,881	6,251,963	3,255,339	—16,021	356,508	2,882,810	866,290
Southern Pacific Co.—Pacific System	6,060°	29,827,043	16,252,945	49,154,661	5,430,589	6,129,440	723,880	12,102,459	1,218,129	25,604,497	23,550,164	8,680	1,440,376	22,118,468	4,425,121
Texas & New Orleans	458	1,327,923	502,720	1,941,660	273,787	299,948	40,825	712,952	53,100	1,380,612	561,048	9,366	76,295	494,119	97,668
Toledo & Ohio Central	441	1,790,555	346,219	2,227,574	308,237	353,234	34,730	670,979	38,359	1,405,539	822,035	57,498	84,678	794,855	—91,358
Trinity & Brazos Valley	455♁	1,010,566	115,472	1,147,421	197,616	197,525	31,579	503,741	64,691	995,152	152,269	.....	21,853	130,415	—26,152
Union Pacific	3,384△	19,991,610	5,926,586	28,161,820	2,728,568	2,663,606	710,118	6,318,979	590,139	13,011,410	15,150,410	7,682	805,026	14,353,065	1,172,902
Wabash	2,514	9,953,805	3,869,108	14,930,748	1,808,085	1,981,096	461,230	5,337,776	399,853	9,988,040	4,942,708	—8,600	398,096	4,536,012	765,715
Wheeling & Lake Erie	458✪	3,065,264	321,651	3,646,883	357,756	830,542	44,047	1,183,246	84,588	2,500,179	1,146,704	37,853	138,469	1,046,088	326,810

* Mileage operated December 31, 1908, 3,992. † Mileage operated December 31, 1908, 492. ‡ Mileage operated December 31, 1908, 1,508. § Mileage operated December 31, 1908, 1,264. ‡ Mileage operated December 31, 1908, 1,456. ° Mileage operated December 31, 1908, 5,586. ♁ Mileage operated December 31, 1908, 429. △ Mileage operated December 31, 1908, 3,309. ✪ Mileage operated December 31, 1908, 442. — Indicates Deficits, Losses and Decreases.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 65, giving a summary of car shortages and surpluses by groups from September 30, 1908, to February 2, 1910, says:

"There is little change in the situation as reported in our last bulletin. The surplus shows a decrease of only 236 cars, with an increase in the shortage of 1,633. There was an increased demand for box cars, the surplus decreasing and the shortage increasing. In coal cars the situation was just the reverse, indicating a lessened demand for this class."

The accompanying table gives surpluses and shortages by groups for the period covered by this report, and the charts show total surpluses and shortages in 1907, 1908, 1909 and 1910.

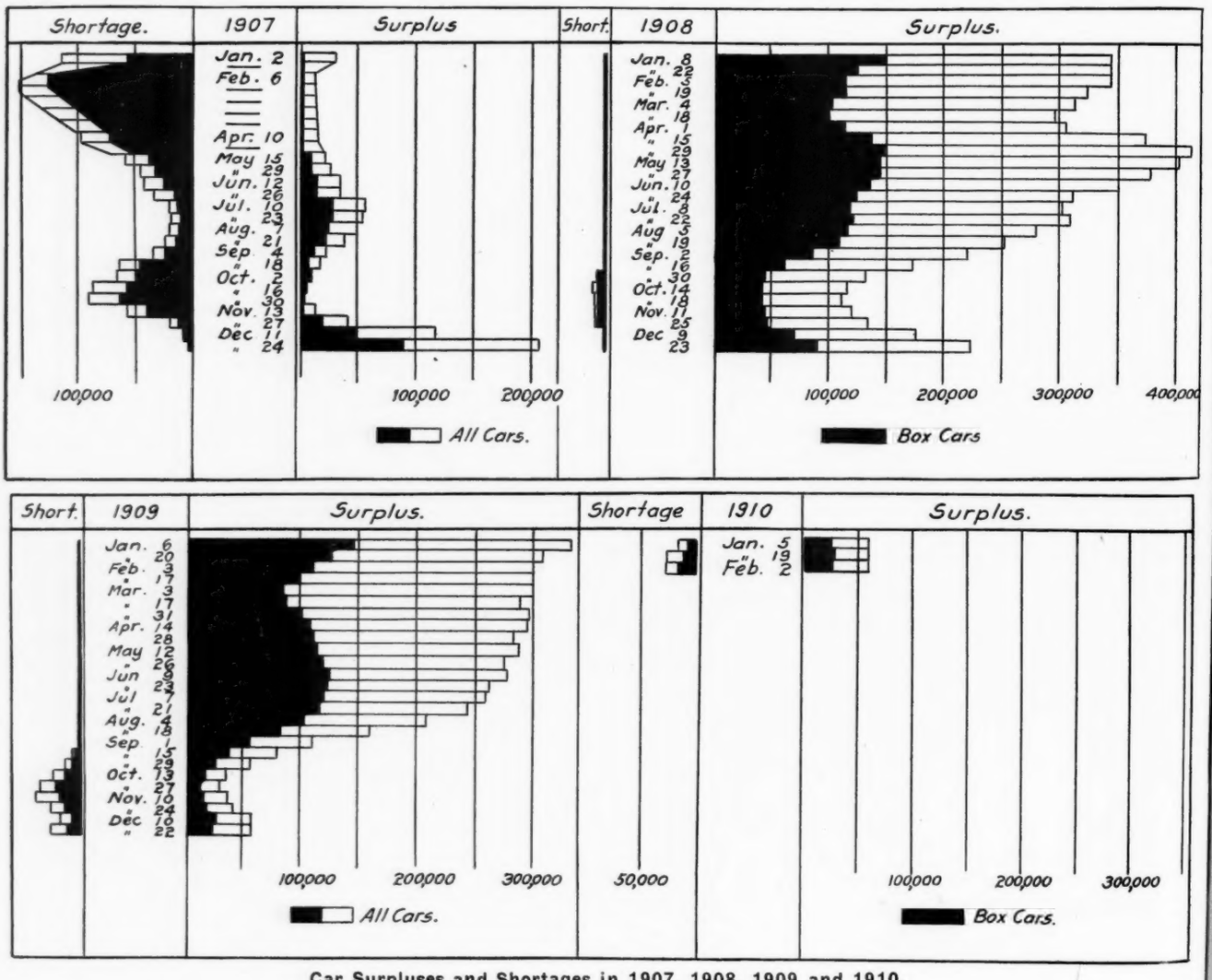
A Good Word for the Carriers.

Rapid handling of the crops of Western Canada by the railways and lake vessels during the shipping season just closed has caused a feeling of general satisfaction among grain men at Toronto and other Canadian centers. The ability of the transportation lines to carry grain and produce shipments promptly has enabled the farmers to reach the markets at opportune times. High prices have been obtained, and as a re-

Car Surpluses and Shortages.

Group*	Date.	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
" 2	" " 2, 1910	22	383	262	1,304	705	2,654	325	2	1,285	33	1,645
" 3	" " 2, 1910	23	385	286	490	1,599	2,760	4,146	106	1,982	1,801	8,035
" 4	" " 2, 1910	10	2,527	85	391	679	3,682	1,644	229	3,400	500	5,773
" 5	" " 2, 1910	18	605	542	237	266	1,650	2,489	482	1,290	197	4,458
" 6	" " 2, 1910	19	5,749	940	1,600	2,373	10,662	2,895	13	89	806	3,803
" 7	" " 2, 1910	4	500	118	682	1,144	2,444	.....	..	.....	..	.....
" 8	" " 2, 1910	13	3,938	515	630	898	5,981	701	15	..	60	776
" 9	" " 2, 1910	11	1,590	500	167	555	2,812	37	..	2	..	39
" 10	" " 2, 1910	17	3,427	999	2,046	4,778	11,250	390	5	38	..	433
" 11	" " 2, 1910	5	2,248	1,689	87	1,254	5,278	745	..	.....	44	789
Total		153	21,352	7,738	8,173	14,337	51,600	13,993	852	8,136	3,644	26,625

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota, and North and South Dakota lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California, and Arizona lines; and Group 11—Canadian lines.



Car Surpluses and Shortages in 1907, 1908, 1909 and 1910.

sult confidence in the good will and the efficiency of the railways and lake lines has been more firmly established than ever before.

Grain that brought in the market more than $75,000,000 was delivered by the railways to Lake Superior ports alone, and from there taken by a fleet of eighty-one Canadian vessels to various markets. The wheat crop reached the total of more than 138,000,000 bushels in the three western provinces—Alberta, Saskatchewan and Manitoba. There was no car shortage, as there has been at times in years past, although the crops were much larger.—*Journal of Commerce* (New York).

INTERSTATE COMMERCE COMMISSION.

The commission find that rates of $1.35 per 100 lbs. in carloads and $1.85 per 100 lbs. in L. C. L. on brass-covered iron tubing from New York City and neighboring points to San Francisco, Cal., found unreasonable, and $1.25 in carloads and $1.75 in L. C. L. prescribed as maximum rates. Reparation awarded. (17 I. C. C., 475.)

STATE COMMISSIONS.

Private Cars in Pennsylvania.

The Pennsylvania State Railroad Commission has declined to entertain the complaint of the Individual Car Owners' Association concerning the burdens put upon private car owners by the railways. The association, which has its headquarters at Pittsburgh, laid before the commission its complaint about excessive bills for repairs and other things, which have been frequently mentioned in the columns of the *Railway Age Gazette*. The substance of the commission's decision is that the controversy should be taken to the courts, or perhaps to the Interstate Commerce Commission.

At the hearing on this complaint Arthur Hale, general agent of the American Railway Association, gave some facts concerning the practice of the railways with freight cars owned by outside parties, and incidentally offered a gentle reminder that the private car owners in claiming to control 50,000 cars in Pennsylvania were exaggerating their figures. He also told the private car owners in substance that their troubles with the railways were no worse than those of the railways with each other. Mr. Hale thinks that there are not over 134,000 private cars in the country. The latest statistics available show that 170 of the principal railways had on their lines 94,000 private cars. As to the rates he said:

From experience I have learned that the private car question is not one question, but a number of questions. The refrigerator cars open one question, the tank cars another question, and so on. When we paid three-fourths of a cent a mile for cars there were a number of private box car lines which paid. The reduction of the rate to six-tenths of a cent made these lines unprofitable, and there are now practically no private box cars. There are fewer stock cars than there were. There are more coal cars. Some coal shippers find it more profitable to own their own cars, because they can—or could, at least—secure larger shipments. The mileage rate is not compensatory. It would not pay anybody to build coal cars for the mileage rates. The cost of the repairs is too heavy.

COURT NEWS.

The officers of Jefferson county, Kentucky, have again failed in their litigation to compel the Southern Pacific Company, which is a Kentucky corporation, to pay a tax on a sum representing the whole of its property. The assessment was $50,000,000. The State Court of Appeals has declared this illegal and says that the correct assessment is $500,000.

Judge Hook, of the federal court at St. Louis, has dismissed the injunction suit brought by the Tennessee Central to restrain the Illinois Central and the Southern Railway from putting into effect certain changes in freight rates. (See *Railway Age Gazette*, Feb. 11, page 326.) The defendants demurred to the petition on the ground that as the Illinois Central is an Illinois corporation and the Southern a Virginia corporation, suits would have to be brought against them in the states of their origin, and this contention was upheld.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

L. D. P'Poole has been appointed auditor of the Atlantic & St. Andrews Bay, with office at Dothan, Ala., succeeding W. F. McClellan.

C. K. Moffett has been temporarily appointed to act as counsel for the Texas Mexican, with office at Laredo, Tex., succeeding E. A. Atlee, deceased.

W. H. Elmendorf, whose appointment as auditor of the Lake Erie & Western, with office at Indianapolis, Ind., has been announced in these columns, was appointed also auditor of the Ft. Wayne, Cincinnati & Louisville and the Northern Ohio.

Daniel Willard, president of the Baltimore & Ohio, has been elected also president of the Baltimore & Ohio Southwestern, succeeding Oscar G. Murray, resigned. A history of Mr. Willard's railway life was published in our issue of January 7, page 49.

C. P. Crawford, auditor of the Erie at New York, has been appointed the principal officer in charge of the accounts of that company, succeeding M. P. Blauvelt, comptroller, resigned to become head of the accounting department of the Illinois Central.

Ernest F. Haubold has been appointed assistant auditor of freight accounts of the New York Central & Hudson River. Arthur L. Linn, Jr., assistant auditor and auditor of subsidiary lines, has also been appointed auditor of the Merchants Despatch and the Western Transit Co., both with offices at New York.

H. D. Foster, assistant auditor of the Chicago, Burlington & Quincy at Omaha, Neb., has been appointed assistant general auditor, with office at Chicago, succeeding George B. Dunbar, resigned on account of ill health. J. D. Shields, auditor of freight accounts at Chicago, succeeds Mr. Foster, and J. W. Newell succeeds Mr. Shields, effective March 1.

E. H. Fitzhugh, whose election as first vice-president of the Grand Trunk has been announced in these columns, was born on February 1, 1853, at Danville, Montgomery county, Mo.

E. H. Fitzhugh.

He began railway work in 1873 as a clerk in the office of the master car builder of the St. Louis, Kansas City & Northern, now a part of the Wabash, at St. Louis, Mo. After serving in the car accountant's office of the same company he was made chief clerk to the superintendent of the Western division of the Wabash, remaining in that position until 1889, when he became master of transportation for the lines west of the Mississippi river on the Wabash at Moberly, Mo. In January, 1896, he was appointed secretary to the general manager of the Grand Trunk at Montreal, Que., and the following July was made superintendent of the Middle division at Toronto, Ont. From May, 1899, to March, 1901, he was vice-president and general manager of the Central Vermont at St. Albans, Vt. He was appointed assistant to the president of the Southern Pacific in May, 1901, at San Francisco, Cal., remaining in that position until November of the same year. The following February he returned to the Central Vermont as vice-president and general manager, and on January 1, 1905, was elected third

vice-president of the Grand Trunk, and also retained his office of vice-president of the Central Vermont, which positions he held at the time of his recent election as first vice-president of the Grand Trunk, retaining also the vice-presidency of the Central Vermont, as well as the vice-presidency of the Detroit & Toledo Shore Line.

M. P. Blauvelt, comptroller of the Erie and the New York, Susquehanna & Western at New York, N. Y., has been appointed comptroller of the Illinois Central, the Indianapolis Southern and the Yazóo & Mississippi Valley, with office at Chicago, succeeding C. F. Krebs, resigned. He will have charge of the accounting, treasury and freight claim departments.

Howard G. Hetzler, whose election as president of the Chicago & Western Indiana and the Belt Railway Company of Chicago, has been announced in these columns, was born in 1863 at La Moille, Ill. He graduated from the University of Michigan in 1886, and began railway work in the same year in the engineering department of the Chicago, Burlington & Quincy. From 1891 to 1892 he was engineer of maintenance of way of the Louisville, New Albany & Chicago, now a part of the Chicago, Indianapolis & Louisville, and was then for six years roadmaster of the Burlington at Chicago. In 1898 he was made superintendent of freight terminals and five years later superintendent of the Chicago division. He was elected president of the Metropolitan West Side Elevated Railroad in May, 1905, which position he held until his recent election.

Richard A. White, whose appointment as general auditor of the New York Central lines east of Buffalo has been announced in these columns, was born in June, 1860, at Hartford, Conn. Mr. White graduated from the Hartford public high school in 1877, and from Trinity College at Hartford in 1881. He began railway work as ticket agent and freight clerk in the spring of 1882 at the Harlem river station, New York, of the New York, New Haven & Hartford, and about two years later entered the office of the general auditor of the New York, West Shore & Buffalo. On the reorganization of that company in January, 1886, as the West Shore he became chief clerk to the auditor of disbursements. He was in charge of statistics in the comptroller's office of the New York Central & Hudson River in October, 1889, and was appointed auditor of disbursements in May, 1893, becoming auditor on February 1, 1906, which position he held at the time of his recent appointment. Mr. White has been appointed also general auditor of the Rutland Railroad, the Rutland Transit Co., the Merchants Despatch and the Western Transit Co.

Operating Officers.

M. H. MacLeod, general manager of the Canadian Northern at Winnipeg, Man., has been transferred to Vancouver, B. C.

W. S. Fraser has been appointed trainmaster of the Eastern division of the Louisiana Railway & Navigation Co., with office at Baton Rouge, La., succeeding R. B. Foss, resigned.

G. Radetzki, general superintendent of the Houston & Texas Central, the Houston East and West Texas and the Houston & Shreveport, with office at Houston, Tex., has resigned to engage in other business.

J. T. Wallis, superintendent motive power of the Pennsylvania Railroad at Williamsport, Pa., has been appointed acting superintendent of the West Jersey & Seashore, with office at Camden, N. J., succeeding D. H. Lovell, granted leave of absence on account of ill health.

J. E. Hood, trainmaster of the Chicago, Milwaukee & Puget Sound at Alberton, Mont., has been appointed acting superintendent, with office at Missoula, Mont., succeeding C. H. Marshall, granted leave of absence on account of ill health. W. C. Stephens has been appointed acting trainmaster, succeeding Mr. Hood.

A. B. Stevenson, superintendent of the Utah division of the Oregon Short Line at Salt Lake City, Utah, has been appointed superintendent of the Idaho division, with office at Pocatello, Idaho, succeeding W. H. Jones, assigned to other duties. A. F. Brewer, car service agent at Salt Lake City, succeeds Mr. Stevenson.

Edward E. Young, whose appointment as general superintendent of the Chicago, Burlington & Quincy, with office at Alliance, Neb., has been announced in these columns, was born November 7, 1859, at Bloomington, Ill. He received a common school education and began railway work in 1879 with the Burlington as a freight brakeman on the Creston division, and was later a conductor. Beginning in 1884 he was about a year at Red Oak, Iowa; then 12 years at Pacific Junction, Iowa, and nine years at St. Joseph, Mo., in charge of yards. In April, 1906, he was made a trainmaster at Lincoln, Neb., was transferred to Denver, Colo., in the latter part of that year, and a month later was made superintendent of the McCook division. In November, 1908, he was transferred as superintendent to the Sheridan division, which position he held until his recent promotion.

N. W. Smith, whose appointment as superintendent of the Central division of the Philadelphia, Baltimore & Washington has been announced in these columns, began railway work on the Pennsylvania as a rodman on the Sunbury division of the Philadelphia & Erie on April 24, 1893. The following year he was made assistant supervisor and was later transferred, serving at various times on four other divisions in the same capacity. In 1899 he was put in charge of experimental track work on the Middle division. In 1900 he was appointed supervisor of the Eastern division, and two years later was made supervisor of the Philadelphia division. In 1905 he was transferred to the office of the principal assistant engineer as supervisor at Altoona, and the following year was made assistant to the principal assistant engineer at that place, remaining in that position until April 1, 1907, when he was made division engineer of the Middle division, which position he held at the time of his recent appointment.

A. J. Whitney, Jr., whose appointment as superintendent of the Maryland division of the Philadelphia, Baltimore & Washington has been announced in these columns, was born October 11, 1862, at Harrisburg, Pa., and was educated in the public schools and at Harrisburg academy. He began railway work in June, 1881, and entered the service of the Pennsylvania as a rodman on the Lewisburg & Tyrone. In 1884 he was assigned to special work in the principal assistant engineer's office at Philadelphia. Four years later he was made assistant supervisor at Altoona, and the following year was transferred to the Philadelphia, Baltimore & Washington in the same capacity, since which time he has been consecutively: 1893 supervisor on the Tyrone division; 1897 supervisor of the Pittsburgh division; 1901 assistant engineer Western Pennsylvania division; 1903 assistant engineer West Jersey & Seashore; 1905 principal assistant engineer Pennsylvania Railroad division, and since April 1, 1907, superintendent of the Delaware division, from which position he has just been promoted.

Traffic Officers.

H. H. Smith has been appointed a soliciting agent of the Louisville & Nashville, with office at Chicago.

C. E. Benjamin, general agent of the Canadian Pacific at Chicago, has been appointed general tourist agent, with office at Montreal, Canada.

H. M. Griggs, assistant general coal and ore agent of the New York Central Lines at Cincinnati, Ohio, has had his office changed to Chicago.

H. C. Ewing has been appointed Pacific coast agent of the Traders' Despatch, with office at San Francisco, Cal., succeeding F. H. Stocker, promoted.

C. R. Sirkosky has been appointed a traveling freight agent of the Missouri, Kansas & Texas, with office at Oklahoma City, Okla., succeeding J. J. Hartnett, promoted.

Victor Jones, city passenger and ticket agent of the Great Northern at Sioux City, Iowa, has been appointed a traveling passenger agent, with office at Des Moines.

Samuel T. Stephens has been appointed a traveling passenger agent of the Cleveland, Cincinnati, Chicago & St. Louis, with office at Sandusky, Ohio, succeeding G. C. Tolman, retired.

F. E. Roesler, traveling passenger and immigration agent of the Kansas City Southern at Kansas City, Mo., has been appointed industrial and immigration agent, with office at Kansas City, Mo.

Howard M. Biscoe, general freight agent of the Boston & Albany at Boston, Mass., has been appointed assistant freight traffic manager, with office at Boston, and his former position has been abolished.

P. E. Meany has been appointed general agent of the Great Northern, with office at Milwaukee, Wis., succeeding H. J. Stolz, resigned to become general manager of the Bartles Oil Company at St. Paul, Minn.

F. M. Cole, commercial agent of the New York Central Lines at Peoria, Ill., has been appointed general agent, with office at Kansas City, Mo., succeeding H. F. Ledlie, promoted. G. H. McHugh succeeds Mr. Cole.

H. Page has been appointed a general agent of the Missouri, Kansas & Texas of Texas, succeeding G. A. Carter, resigned, and R. W. Hockaday, general ticket agent at Parsons, Kan., has been appointed industrial commissioner, both with offices at Dallas, Tex.

J. G. Morrison, assistant general freight agent of the Chicago Great Western at Chicago, has been appointed assistant to the vice-president, with office at Chicago. F. S. Hollands, chief of the tariff bureau of the Chicago & Alton at Chicago, succeeds Mr. Morrison.

John W. Byrne, traveling freight solicitor of the Vandalia at Terre Haute, Ind., has been appointed commercial agent, with office at Peoria, Ill., succeeding J. E. Fenelon, appointed special agent in the freight department at St. Louis, Mo. M. P. King succeeds Mr. Byrne.

Milton M. Beekman has been appointed southeastern passenger agent of the Halifax & Southwestern, the Canadian Northern Quebec and the Quebec & Lake St. John, and H. R. Stevens has been appointed a traveling passenger agent, both with offices at Washington, D. C.

W. H. George, traveling freight agent of the Chicago, Milwaukee & St. Paul at Peoria, Ill., has been transferred to Chicago; C. B. Wilser, commercial agent at Minneapolis, Minn., has been transferred to Rapid City, S. Dak.; C. E. Mumford succeeds Mr. Wilser, with office at Minneapolis.

C. C. Anderson, traveling passenger agent of the Rock Island Lines at Peoria, Ill., has been appointed district passenger agent, with office at St. Louis, Mo., succeeding H. P. Mantz, resigned to become vice-president and business manager of the Mississippi Valley Advertising Company at St. Louis.

C. J. Pearson, commercial agent of the Chicago, Burlington & Quincy at Pueblo, Colo., has been transferred to Denver, Colo. A. S. Cuthbertson, commercial agent of the Colorado & Southern at Pueblo, has been appointed also commercial agent of the Burlington, succeeding Mr. Pearson, the freight offices of the two roads having been consolidated.

W. E. McGee, traveling passenger agent of the Southern, at Augusta, Ga., has been appointed division passenger agent, with office at Charleston, S. C., succeeding John C. Lusk, resigned to become assistant to president of the Jemison Real Estate & Insurance Co. at Birmingham, Ala. A. H. Acker, city passenger and ticket agent at Savannah, succeeds Mr. McGee, with office at Augusta.

Benjamin R. Boggs, division freight agent of the Philadelphia & Reading at Harrisburg, Pa., has been appointed assistant general freight agent of that company and controlled lines, with office at Philadelphia, Pa. Edgar D. Hilleary, division freight agent of the Philadelphia & Reading and the Atlantic City Railroad, succeeds Mr. Boggs, with office at Harrisburg, and Harry C. Stauffer, succeeds Mr. Hilleary, with office at Philadelphia.

The following have been made traveling freight agents of the St. Louis & San Francisco: H. A. Wheeling and J. A. Hawkins, with office at Memphis, Tenn.; F. D. Royce in New York; K. M. Custis at Pittsburgh, Pa.; J. E. Branch and L. E. LeFaivre at Atlanta, Ga., and E. W. Trott at Joplin, Mo. F. E. Webster and H. C. South have been appointed traveling freight agents of the Chicago & Eastern Illinois, the Evansville & Terre Haute and the Evansville & Indianapolis, with office at Milwaukee, Wis.

J. W. Daly, whose appointment as assistant passenger traffic manager of the New York Central Lines West of Buffalo, with office at Chicago, has been announced in these columns, was born June 2, 1868, at Canton, Ill. He began railway work in 1882 as a telegraph operator on the Wabash, St. Louis & Pacific, now a part of the Wabash. He was then consecutively telegraph operator at Horton, Kan., ticket agent at Burlingame and later at Augusta, Kan., and at Springer, N. Mex., on the Atchison, Topeka & Santa Fe; chief clerk in the local office and chief yard clerk with the Wisconsin Central at Chicago; chief clerk in the general office of the Jacksonville Southeastern, now a part of the Chicago, Peoria & St. Louis; general passenger and ticket agent of the Jacksonville, Louisville & St. Louis, now a part of the Jacksonville & St. Louis. In April, 1901, he was appointed southern passenger agent of the Lake Shore & Michigan Southern at Cincinnati, Ohio, and a year later general eastern passenger agent at Buffalo, N. Y. He was then made chief assistant general passenger agent of the Lake Shore and the Michigan Central at Buffalo, and in January, 1907, was appointed general passenger agent of the Lake Shore at Cleveland, Ohio, from which position he has just been promoted.

J. W. Daly.

Gerrit Fort, whose appointment as general passenger agent of the New York Central & Hudson River, the Boston & Albany and the West Shore, was recently announced in these columns, was born on November 12, 1865, at Cedar Rapids, Iowa. He began railway work in the fall of 1884 and was later clerk to the superintendent of the Burlington, Cedar Rapids & Northern, now a part of the Chicago, Rock Island & Pacific at Cedar Rapids, remaining in that position until January 1, 1887, when he became clerk to the auditor of the Wabash at Chicago. In September, 1889, he was appointed assistant rate clerk in the general passenger department of the New York Central & Hudson River at New York, and two years later was made chief clerk in the same department. He became secretary of the Central Passenger Association at Chicago on January 1, 1897, remaining in that position until September, 1900, when he was made assistant general passenger agent of the Union Pacific at Omaha, Neb. In June, 1907, he went to New York as assistant to C. F. Daly, vice-president of the traffic department of the New York Central Lines, which position he held at the time of his recent appointment.

Gerrit Fort.

George T. Foyes, traveling passenger agent of the Northern Pacific at Cincinnati, Ohio, has been appointed traveling immigration agent, with office at Chicago. J. C. Eaton has been

appointed traveling immigration agent, with office at Cincinnati. J. J. Gartner, traveling passenger agent at Atlanta, Ga., succeeds Mr. Foyes, and M. J. Costello succeeds Mr. Gartner.

L. W. Landman, general western passenger agent of the Lake Shore & Michigan Southern at Chicago, has been appointed general passenger agent of the Lake Erie & Western, with office at Indianapolis, Ind., succeeding C. L. Hilleary, appointed general agent of the New York Central Lines, with office at St. Louis, Mo. L. D. Heusner, general western passenger agent of the Michigan Central at Chicago, succeeds Mr. Landman, and I. P. Spining, general northern agent of the Cleveland, Cincinnati, Chicago & St. Louis at Chicago, has been made general agent in the passenger department of the Big Four and the Michigan Central at Chicago.

Engineering and Rolling Stock Officers.

W. R. Thomas, road foreman of engines of the Cincinnati, New Orleans & Texas Pacific, has been promoted to general foreman of the mechanical and car departments, with office at Ludlow, Ky.

W. C. Smith, engineer maintenance of way of the Northern Pacific lines east of Paradise, Mont., at St. Paul, Minn., has been appointed chief engineer of maintenance of way, with office at St. Paul.

M. H. Wickhorst, engineer of tests of the Chicago, Burlington & Quincy, with office at Aurora, Ill., has been granted a leave of absence for one year to become chief chemist in charge of rail tests by the American Railway Engineering and Maintenance of Way Association. W. A. Derby succeeds Mr. Wickhorst.

J. B. Hutchinson, Jr., whose appointment as division engineer of the West Jersey & Seashore has been announced in these columns, was born at Bristol, Pa., on March 3, 1876. He entered the services of the Pennsylvania Railroad in January, 1898, as a rodman, and the next year was transferred to the office of the principal assistant engineer at Altoona, Pa., since which time he has been consecutively, November 1, 1899, assistant supervisor, West Penn division; February 2, 1900, assistant supervisor Pittsburgh division; July 20, 1901, supervisor West Penn division; July 1, 1905, supervisor Middle division.

William F. Greene, whose appointment as division engineer of the Philadelphia Terminal division of the Pennsylvania Railroad has been announced in these columns, was born at Philadelphia, Pa., on March 11, 1876. He entered the service of the Pennsylvania Railroad January 6, 1899, as a rodman on the Maryland division of the Philadelphia, Baltimore & Washington. In April, 1901, he was appointed transitman in the office of the principal engineer at Altoona, Pa., and the following month was made assistant supervisor on the Baltimore division. In December, 1902, he was transferred to the Pittsburgh division. He was appointed supervisor on the Buffalo division in June, 1904, and the following May was transferred to the Maryland division of the Philadelphia, Baltimore & Washington, which position he held at the time of his recent promotion.

A. B. Clark, whose appointment as principal assistant engineer of the Philadelphia, Baltimore & Washington at Wilmington, Del., has been announced in these columns, was born at Green Village, Pa., on October 1, 1867. He entered the service of the Pennsylvania Railroad in July, 1889, in the office of the assistant engineer at Harrisburg, Pa., and about two years later was transferred to the office of assistant engineer of the Philadelphia division. In January, 1894, he was put in charge of the storage and repair yards at Paoli, Pa., becoming acting assistant supervisor on the Philadelphia division in May, 1895, at Paoli. The following November he was transferred to the office of the principal assistant engineer at Altoona, Pa., leaving that position in July, 1896, to become assistant supervisor at the same place, and was later transferred to the Pittsburgh division. In July, 1900, he was appointed supervisor on the Baltimore division of the Northern Central, and about a year later was made supervisor on the Pittsburgh division, which position he held until December 15, 1905, when he was made assistant engineer of the Middle and Western divisions and the Philadelphia and Erie divisions, leaving that position in April, 1907, to become assistant engineer of the West Jersey & Seashore. He was appointed division engineer of the Maryland division on November 16, 1908, which position he held at the time of his recent promotion.

J. J. Rhoads, whose appointment as division engineer of the Middle division of the Pennsylvania Railroad has been announced in these columns, was born at Bellefonte, Pa., on August 23, 1868. He entered the service of the Pennsylvania Railroad in March, 1889, as a rodman and levelman on construction work. In June, 1892, he was in the office of the engineer of maintenance of way at Philadelphia, Pa., and the following year was made assistant supervisor of the Amboy division. He was later transferred in the same capacity to the Maryland division of the Philadelphia, Baltimore & Washington. He was appointed a supervisor on the Amboy division in April, 1899, and two years later was transferred to the New York division, remaining in that position until July 1, 1905, when he became assistant engineer of the Eastern and Susquehanna divisions. In April, 1907, he was made division engineer of the Philadelphia Terminal division, which position he held at the time of his recent appointment.

J. C. Auten, whose appointment as division engineer on the Maryland division of the Philadelphia, Baltimore & Washington has been announced in these columns, was born on August 31, 1870. He entered the service of the Pennsylvania Railroad as a rodman in the office of the assistant engineer of the Sunbury division on Aug. 17, 1887, and was later in charge of the drafting room at that place. He was made acting assistant supervisor of the Philadelphia and Erie divisions in April, 1894, and the following November was made supervisor on the same division. In October, 1898, he was appointed supervisor of the Baltimore division of the Northern Central, and in December, 1901, was transferred as supervisor to the Maryland division of the Philadelphia, Baltimore & Washington. He was appointed assistant engineer of the Elmira and Canandaigua division of the Northern Central in April, 1902, and the following June was transfered in the same capacity to the West Penn division, becoming assistant engineer of the Eastern and Susquehanna division in April, 1907. He remained in this position until November, 1908, when he was made division engineer of the West Jersey & Seashore.

Purchasing Officers.

Henry Mel, material agent of the National Railways of Mexico at Beaumont, Tex., has been appointed assistant purchasing agent, with office at Beaumont.

Harry A. Fabian, who has been appointed manager of purchases and supplies for the New York, New Haven & Hartford, for the Boston & Maine and for the subsidiary companies of the two corporations, with headquarters at Boston, was born at Montreal Oct. 16, 1876. He received a common school education and at the age of 12 years became messenger in the dining car department of the Canadian Pacific, afterwards serving as a junior clerk in the president's office and as advertising clerk in the passenger department. Following later service as passenger agent at Montreal of the Chicago, Rock Island & Pacific he went to St. Paul, Minn., to become tax commissioner and soon after land commissioner of the Northern Pacific. He next became secretary to President Mellen, of the Northern Pacific, who, after becoming the head of the New York, New Haven & Hartford, called him to the place of assistant to the president. In that capacity Mr. Fabian has had exceptionally large and responsible duties, including the organization of the New Haven's Rhode Island trolley system, supervision of the navigation properties, of the Connecticut trolleys, of the Central New England lines and the management of the New Haven Company's store department, where he introduced successful economies. His duties as assistant to the president at New Haven will be taken by Vice-President E. G. Buckland, whose headquarters have been at Providence, R. I.

OBITUARY.

E. S. Jewett, general agent in the passenger department of the Missouri Pacific, with office at Kansas City, Mo., died at Kansas City on February 13.

Railway Construction.

New Incorporations, Surveys, Etc.

ALBERTA ROADS.—According to press reports from Edmonton, Alb., a 50-mile line, to open up the coal fields of the Yellow Head Pass Coal & Coke Co. west of Edmonton, will be built this year. Contracts are to be let soon. W. O'Brien, Renfrew, Ont., is said to be interested.

ARIZONA & COLORADO.—According to press reports from Farmington, N. Mex., plans are taking definite shape for the construction of a line from Farmington south to Gallup, thence south to Lordsburg, and west to Globe, Ariz. J. W. Reagan, Farmington, is the engineer in charge. (Aug. 6, p. 258.)

ARKANSAS, OKLAHOMA & WESTERN.—An officer writes that construction work is now under way on an extension from Rogers, Ark., southeast to Huntsville, 35 miles. (March 19, p. 651.)

ATCHISON, TOPEKA & SANTA FE.—Contract is said to have been given for a new branch from Lometa, Tex., on the Gulf, Colorado & Santa Fe, west to a point near Eden, about 100 miles. The contract is said to be worth about $2,000,000. The line will traverse the valley of the San Saba river for 30 miles, and then run through the Brady Creek valley, passing through the towns of San Saba and Brady. (Dec. 17, p. 1212.)

BALTIMORE & OHIO.—Work, as outlined by President Willard, is to be immediately placed under way. The general plan has been approved and provides for expenditures aggregating something over $8,000,000. Of this, $5,000,000 is to be used on the roadway, largely for improving operation at points where congestion is most liable to occur. Much work is to be done on the mountain sections of the road, where two tunnels are to be eliminated and third running tracks laid at the approaches to others, that will greatly facilitate passage through them. To provide sufficient water supply, a 90,000,000-gal. reservoir, with a pipe system, will be constructed. The enlargement and reconstruction of yards, new helper stations, etc., are included in the improvements. The company has $16,000,000 available for road improvements and as much more for new motive power and equipment.

BURRARD INLET TUNNEL & BRIDGE CO.—Incorporation has been applied for to the Dominion parliament. The plans call for a tunnel under the first narrows of Burrard inlet and a bridge over the second narrows with the necessary approaches from the south shore at Vancouver, B. C., to the opposite shore. The company also proposes to build lines of railway not exceeding 10 miles. The bridge and tunnel will be constructed for the operation of steam and street railways, as well as highway traffic. Permission is also asked to build a line from the northern ends of the bridge and tunnel, easterly along the shore line of North Vancouver to Deep Cove, on the north arm of Burrard inlet, and westerly along the shore line of North Vancouver to Horseshoe bay, on Howe sound. Burns & Walkem, Vancouver, are solicitors for the company.

CANADIAN PACIFIC.—William White, second vice-president, announces that the western extensions to be undertaken this year will be principally colonization lines and links connecting existing lines; the total mileage will be 621 miles. Of this 346 miles will be in Saskatchewan, 45 miles in Alberta and 174 miles in British Columbia. The section of the main line between Winnipeg, Man., and Portage la Prairie, 56 miles, will be double-tracked. The work will be pushed as rapidly as possible, but it is possible that all the work may not be completed within the year. The estimated expenditure for road construction is between $8,000,000 and $10,000,000. In addition, other improvements will be made, including new stations. The station at Regina, Sask., is to be 480 ft. long, part of which is to be four stories high, and is to cost over $500,000. A large bridge will be built over the South Saskatchewan river at Outlook, to cost $1,000,000. (Feb. 4, p. 280.)

CHICAGO & NORTH WESTERN.—According to press reports active construction work has been started on extensions in Monroe county, Iowa, through coal fields near Albia.

CHICAGO, BURLINGTON & QUINCY.—According to press reports this company is planning to build an extension from Cheyenne, Wyo., south to Wellington, Colo., about 35 miles.

CHICAGO, MILWAUKEE & PUGET SOUND.—Work is now under way on the line from Monckton, Wash., northwest to Everett, about 50 miles. Contract has been let to H. C. Henry. (Nov. 26, p. 1036.)

CHICAGO, ROCK ISLAND & PACIFIC.—This company is said to be making plans for a cut-off from Atlantic, Iowa, west to Council Bluffs. The new line is to have easier grades and will be about 45 miles long as compared with 60 miles on the existing line.

CINCINNATI, HAMILTON & DAYTON.—Announcement is said to be made that contracts for improvements to cost $8,000,000 will be carried out during 1910. Of this amount $2,000,000 is to be spent on the Cincinnati, Ohio, terminal; $1,000,000 reducing grades and curves, and $1,000,000 for a new ore dock at Toledo. New terminal yards are also to be constructed at Toledo, at a cost of $750,000, and a new freight warehouse is to be put up, to cost $250,000. About 75 miles of line will be relaid with 85-lb. rail and eight bridges will be renewed.

DENVER, LARAMIE & NORTHWESTERN.—According to press reports this company is planning to make extensive improvements and expects to build about 200 miles of line this year. (Oct. 1, p. 613.)

ESTACADA & GULF.—An officer is quoted as saying that material is being assembled at Roby, Tex., for the completion of the line into that place. Grading has been finished from McCaulley west to Roby and track has been laid within four miles of Roby. The line is to be extended west 100 miles from Brady. T. H. Landon, chief engineer, Roby. (Jan. 21, p. 164.)

GRAND TRUNK PACIFIC.—According to press reports bids for the remaining 135 miles of the branch from Tofield, Alb., south to Calgary, are to be let this week, and it is expected to have the entire line finished during 1910. (Nov. 19, p. 990.)

GULF, DELTA & NORTH WESTERN.—Incorporated in Louisiana, with $2,000,000 capital, to build from Port Barre, La., north to Moreauville, about 35 miles. O. H. Williams, New Orleans, La.; D. C. Scarborough, Natchitoches; S. Chesney, St. Louis, Mo., and J. T. McElroy, Odessa, Tex., are directors.

KANSAS, LAWTON & GULF.—This company has amended its charter, permitting it to build an additional branch line 300 miles long from the southern part of Comanche county, Okla., northeast through Stephens, Grady, McClain, Cleveland, Oklahoma, Logan, Payne, Pawnee and Osage counties, to the Kansas state line. The company was originally organized with $5,000,000 capital, and office at Walter, to build from Randlett, in Comanche county, northwest to the northern part of Harper county, at the Kansas state line, 250 miles. The directors include: A. W. Green, C. M. Bechan, H. F. Crossman and E. F. Sawyer, Walter and J. M. Bellamy, Lawton.

LACLEDE, DALLAS & WESTERN.—Incorporated in Missouri, with $600,000 capital, to build from Phillipsburg, Laclede county, Mo., west to a point eight miles west of Buffalo, 30 miles. S. T. McDermott, B. B. Joffee, C. M. Blackman, C. W. German and W. F. Farren, all of Kansas City, are interested.

LANSING & NORTHEASTERN (ELECTRIC).—Incorporated in Michigan, with $500,000 capital, to build electric lines in eastern Michigan. The first line to be built will be from Lansing northeast to Owosso, about 30 miles, and it is expected that this section will be finished by October 1. The route from Lansing parallels the Grand Trunk to Morrice, then runs north to Owosso. An extension is projected from Morrice east through Durand, thence northeast to Flint. An extension is also projected from Owosso, northeast to Saginaw. The incorporators include: G. G. Moore, K. Lathrop and S. W. Ladd, Detroit, and T. W. Atwood, Caro. All the incorporators are said to be interested in the Michigan United Railways Co., Lansing.

MINSTER & LORAMIE.—See Western Ohio (Electric).

MISSOURI PACIFIC.—Improvements are to be made by this company in Kansas at a cost of $4,000,000.

Missouri Roads (Electric).—F. C. Yentsch, Mount Vernon, Mo., is trying to interest Springfield, Mo., capitalists in a project to build an interurban line from Springfield west via Hazeltine, Halltown, Paris Springs, Mount Vernon and Stotts City to Carthage, about 65 miles. The Springfield Traction Co. is said to have surveys made over a different route for a line between these two places.

New York Central & Hudson River.—About April 1 the executive officers of the New York Central line will vacate their present quarters in the west wing of the Grand Central station, which has been in use for the past 35 years, and move into the new office building on Lexington avenue. At about the same time the four tracks remaining on the old level under the train shed will be torn up, permitting the work of demolishing the station building and the excavation. The old annex on the east side of the main building has already been torn down. Excavation for the whole terminal plant is more than half finished and track-laying is about half finished. On the main station level 22 tracks are ready out of a total of 42, and on the suburban level 10 tracks are in place, out of a total of 24. Up to the present time the company has spent upon terminal work, electrification and connected improvements a total of about $43,000,000, roughly classified as follows: Grand Central terminal construction, $15,000,000; real estate, $10,500,000; electrification of road, $10,700,000; four-tracking and station improvements, $6,000,000, and elimination of grade crossings, $500,000. These figures include $4,000,000 for the big post office and office buildings, including the northeast corner of the station building proper. Electrification has been finished as far as Mount Vernon, N. Y., on the Harlem division, and as far as Yonkers, on the Hudson division. It is expected that all train service on the Harlem division as far as White Plains, the limit of the electric zone, will be electrically operated in March. The extension of electric operation north of Mount Vernon, involving the construction of two new sub-stations, is rapidly approaching completion. The extension of electric suburban service beyond Yonkers on the Hudson division is less definite because of the large amount of heavy work included in the improvements on that division. Preliminary work is being pushed at all important points between Spuyten Duyvil and Harmon. The electrification has resulted in other improvements being made, including the elimination of grade crossings and the building of a large number of new stations within the electric zone. The four-tracking on the Hudson division already authorized will greatly increase the transportation capacity in and out of New York and will make it possible for a considerable separation of passenger and freight trains, as well as the operation of express and local trains, without interference with each other. At Spuyten Duyvil preliminary work is well advanced for four-tracking and for correction of alinement. Otherwise the four-tracking has been completed from Mott Haven to Hastings, with provision for two additional freight tracks from Spuyten Duyvil to Yonkers, and similar work is well advanced at Hastings. A new passenger station and new freight yards are to be added at Hastings. The four-track work is finished through Dobbs Ferry and is well under way at Ossining. Grading for the fourth track is under way between Dobbs Ferry and Harmon. It is expected that the total cost of the terminal and electric zone improvements will be between $90,000,000 and $100,000,000. All the real estate has been bought and work on the terminal proper is about half finished.

Northern Electric.—According to press reports rights-of-way have been secured in Tehama county, Cal., for an extension from Chico, northwest to Los Molinos, and eventually to Red Bluff, in all about 45 miles. The company is also planning to build from Yuba City west through Meridian to Colusa, thence north to Hamilton City. (Dec. 3, p. 1108.)

North Western Corporation.—This company is said to be planning to build an electric line between Salem, Ore., and Eugene, and probably between Salem and Portland. Negotiations are said to be under way which may result in the immediate construction of the Salem-Eugene line. A. Welch, general manager, Fenton building, Portland, Ore.

Ohio River & Northern.—According to press reports, construction work is to be pushed this spring on a line from Lorain, Ohio, on Lake Erie, southwest to Wellsville. Work on this road was started some years ago and was abandoned in 1908. Connection will be made with the steel works at Lorain. The line will pass near Lisbon, in Columbia county, running south via West Point to Wellsville. The line is projected east up the Ohio river to East Liverpool and via Smith's Ferry to Midland, Pa. Later an entrance is contemplated into Pittsburgh. Joseph Ramsey, Jr., Orange, N. J., is back of the project. The original promoters included P. F. Smith, W. P. De Arnitt, Pittsburgh, Pa., and J. L. Francis, Chicago.

Ottawa, Montreal & Eastern.—A railway bill to incorporate this company has been reported with a number of amendments. The company is to have a capital of $2,000,000, with office at Montreal, Que., and plans to build 230 miles of railway from St. Agnes, on Lake Megantic, in Compton county, Que., west. The proposed line is to run through the counties of Wolfe, Athabaska, Richmond, Drummond, Yamaska, Bagot, Richelieu, St. Hyacinthe, Vercheres and Chambly, to a crossing of the St. Lawrence river, where either a tunnel is to be pierced or a bridge built at or near Longueuil, continuing to Montreal, thence westerly through the counties of Hochelaga, Jacques Cartier, Laval, Terrebonne, Two Mountains and Argenteuil, crossing the Ottawa river to Prescott county, Ont., and extending on the south side of the river west through Russell and Carleton counties to Ottawa. The incorporators include: W. I. Bishop, A. Jarvis, C. E. Cutler, V. Cusson and M. Tetreau, all of Montreal. (Dec. 10, p. 1168.)

Pacific Railway & Navigation Co.—Passenger train service on 25 miles of completed line at the western end between Tillamook, Ore., and Vosburg, will be inaugurated on April 1. Work trains are now in operation over this portion of the line. The company was organized to build from Hillsboro, west to Tillamook, 91 miles, and track has been laid on 46½ miles. Contracts are let to the J. W. Sweeney Construction Co. and Robert Wakefield, both of Portland, on 41 miles between Timber and Garibaldi. About 800 men are now at work between Hillsboro and Tillamook. The principal work now under way is the construction of bridges and tunnel and rock work excavations. Tunnel number one, at a point 24½ miles west of Hillsboro, 1,400 ft. long, has been finished. On the western end of the line track has been laid on 31½ miles. (Dec. 3, p. 1108.)

South Carolina & Western.—Incorporated in South Carolina, with $500,000 capital, to build from McBee, S. C., southeast via Hartsville to Florence, about 40 miles. The incorporators include J. E. Hancock, W. R. Bonsal and S. Lawrence, Hamlet, N. C.

Springfield Traction Co.—See Missouri Roads (Electric).

Temple & Northwestern.—Organized to build from Temple, Tex., north to Hamilton. Negotiations said to be pending between W. G. McDaniel and residents of Temple to build the line, and as soon as the contract is signed work is to be started. F. F. Downs, J. E. Ferguson and C. M. Campbell, all of Temple, are said to be interested. (Dec. 24, p. 1261.)

Toppenish, Simcoe & Western.—Work is said to be under way by Contractor Leonard, building across the Yakima Indian reservation, in the state of Washington. The contract calls for the completion of the work by July 1. The company was organized to build from Toppenish, Wash., west to Ft. Simcoe, about 30 miles. Frank A. Williams, president, Toppenish. (Dec. 24, p. 1261.)

Trinity Valley & Northern.—An officer writes that contracts have been let to L. S. Powell, Fouts, Tex., and to P. Razor, Dayton, for building 10 miles from Fouts, north. Maximum grades will be 1 per cent. and maximum curvature 3 deg. The grading work involves the handling of from 5,000 to 20,000 cu. yds. per mile. There will be five trestles, ranging from 100 ft. to 276 ft. each. Track has been laid on five miles. (Feb. 4, p. 281.)

Western Maryland.—See an item in regard to this company in Financial News.

Western Ohio (Electric).—According to press reports this company has incorporated the Minster & Loramie and is securing right-of-way for a line from a point on the Western Ohio at Minster, Ohio, south to Loramie, about five miles.

Railway Financial News.

ALBANY & NORTHERN.—This road, extending from Albany, Ga., to Cordele, 36 miles, has been sold to the Georgia Southwestern & Gulf, which will immediately extend the line to Saint Andrews Bay, Florida, on the Gulf of Mexico.

CANADIAN NORTHERN.—See Quebec & Lake St. John.

CANADIAN PACIFIC.—The directors have declared the regular semi-annual dividend of 2 per cent. on the preferred stock and 3 per cent. on the common stock for the half year ended December 31, 1909, and have declared in addition a dividend of one-half of 1 per cent. on the common stock, to be paid from the proceeds of land sales.

CHICAGO & NORTH WESTERN.—See an item in regard to this company in General News.

CRYSTAL CITY & UVALDE.—This company has asked the Texas Railroad Commission for authority to issue bonds at the rate of $15,000 per mile. It recently completed its road from Uvalde, Tex., where it connects with the Galveston, Harrisburg & San Antonio, south to Crystal City, 41 miles.

DELAWARE & EASTERN.—The New York Up-State Public Service Commission has authorized the Delaware & Eastern to issue $400,000 bonds, to be sold at 85, the proceeds to be used to pay off indebtedness incurred in construction work now under way on the line between Schenectady, N. Y., and Hancock. The company has previously been authorized to issue $2,050,000 stock and $4,575,000 50-year 5 per cent. bonds.

DELAWARE RAILROAD.—The directors have voted to make a new lease of the road of the Philadelphia, Baltimore & Washington at a guaranteed rental of 8 per cent.; a stock dividend of 70 per cent. and a cash dividend of 20 per cent. to be paid now in addition.

FLORIDA RAILWAY.—Stockholders have authorized an increase of $2,000,000 in the stock, bringing the total authorized amount up to $4,000,000.

GEORGIA SOUTHWESTERN & GULF.—See Albany & Northern.

GULF & SHIP ISLAND.—The interest coupons on the first refunding and terminal 5 per cent. bonds are to be paid at the Bankers Trust Co., New York, instead of at the office of Fisk & Robinson, as heretofore.

HUDSON COMPANIES.—Harvey Fisk & Sons, New York, are offering $11,000,000 Hudson Companies 6 per cent. secured convertible notes, due 1913, at par. These notes are secured by the deposit of $1,500 4½ per cent. bonds of the Hudson & Manhattan for $1,000 notes. This issue of notes provides for all obligations of the Hudson Companies maturing in 1910, and for advances to the Hudson & Manhattan for the completion of its lines. Harvey Fisk & Sons have issued a circular containing a copy of a letter by President McAdoo, describing the Hudson river tunnel system and the financial condition of the Hudson companies. The circular is accompanied by a map of the lower part of New York City, showing the Hudson tunnels completed and the proposed extensions to the Grand Central station.

IRON MOUNTAIN RAILROAD OF MEMPHIS.—See Union Railway of Memphis.

PHILADELPHIA, BALTIMORE & WASHINGTON.—See Delaware Railroad.

PITTSBURGH & SHAWMUT.—See Pittsburgh, Shawmut & Northern.

PITTSBURGH, SHAWMUT & NORTHERN.—The company has filed a mortgage securing $12,000,000 5 per cent. bonds, and Hallgarten & Co., New York, have arranged to place $3,000,000 of these bonds, the remainder of the issue to be sold from time to time for payment on construction work. The Pittsburgh & Shawmut is an extension of the Pittsburgh, Shawmut & Northern, which latter is now in the hands of a receiver, and it is planned, when the Pittsburgh & Shawmut is completed, that the P., S. & N. will be reorganized and the two properties will be combined.

QUEBEC & LAKE ST. JOHN.—The proposed reorganization plan submitted by the Canadian Northern having been rejected, A. J. Gorrie has been appointed receiver.

ST. LOUIS, IRON MOUNTAIN & SOUTHERN.—See Union Railway of Memphis.

ST. LOUIS, ROCKY MOUNTAIN & PACIFIC.—The interest coupons on the first mortgage bonds and secured notes are to be paid at the Hanover National Bank, New York, instead of at the office of Fisk & Robinson, as heretofore.

UNION PACIFIC.—In an application to list on the New York Stock Exchange $8,402,000 additional first lien and refunding 4 per cent. bonds, the company says that $4,902,000 of these bonds have been issued since June 30, 1909, the balance having been sold prior to that date and accounted for in the last annual report. The proceeds of the sale of $8,402,000 bonds listed were used to reimburse the Union Pacific to the extent of $3,833,568 for advances for construction of the Lane cut-off in Nebraska, known as the South Omaha & Western; for improvements to main line, aggregating $2,921,813, and for 450 freight train cars and 23 passenger train cars, costing $497,021 and $243,408, respectively.

UNION RAILWAY OF MEMPHIS.—Stockholders are to vote March 28 on the question of making a contract with the St. Louis, Iron Mountain & Southern and the Iron Mountain Railroad of Memphis, whereby the Union Railway will lease and operate the terminal properties of the Iron Mountain Railroad of Memphis.

WESTERN MARYLAND.—A member of the executive committee says that a bill is to be introduced in the Maryland legislature to empower the company to sell its unissued treasury stock amounting to $26,040,440. If this bill is passed it will enable the company, it is said, to build and equip its proposed line from Cumberland, Md., to a connection with the Pittsburgh & Lake Erie at Connellsville, Pa., 83 miles. It is estimated that the cost of building and equipping this line will be about $12,000,000.

WINSTON-SALEM SOUTHBOUND.—The stockholders have voted to authorize a mortgage securing $5,000,000 bonds. (Jan. 28, p. 210.)

The New Japanese Railway.

A consular report describes the progress of the new Japanese railway through Manchuria from Antung, on the Yalu river, where the Korean railway line terminates. Thirty-three miles of the Antung end of the line were opened for traffic on November 3, the Mikado's birthday. The line is completed to Shihchiaotzu. The roadbed of this section has already been ballasted and is in good condition. In sections all along the line the grade has been finished or is nearing completion, while of the total length of 166 miles it is estimated that 45 per cent. of the grade work, in point of miles, has already been completed. This does not mean that 45 per cent. of the actual work has been completed, because of the numerous and, in some places, difficult tunnel work. Except the 33 miles already completed the route of the line lies almost wholly in a mountainous and very rough country. The new line will have some 12 or 15 tunnels, varying in length from one mile—the longest—to 100 yds. There will be required some 300 bridges, the longest of which will be over 2,000 ft., while upwards of 50 bridges will be at least 500 ft. in length. The work of tunneling will be pushed as rapidly as possible with the methods employed. There is not a steam shovel or pneumatic stone drill in the work along the line. Even the work of pile driving is being done by hand in the most primitive manner. It is estimated that the longest tunnel will be completed in a little more than one year from November last, and the completion of this tunnel will mark the completion of the entire line. It is hoped to have the 40-mile section from Antung to Fenghuangcheng completed and in operation by July 1, next.

Supply Trade Section.

From the returns of the first two months of the fiscal year of the Western Electric Co., New York, it is estimated that the year 1909-1910 will show a gross business of about $61,000,000. If this estimate is realized the current year will be the second best in the history of the company. The gross earnings in 1906 were $69,000,000.

Green, Hook & Co. has been organized to manufacture and sell chemicals for boiler treatment. Jacob W. Hook and Stanley K. Green are interested in the company. The main office will be in the Hudson Terminals building, New York; the main laboratory and works at Jersey City, N. J., and a branch laboratory at Baltimore, Md. Sales offices will be located in Boston, Mass.; Philadelphia, Pa.; Baltimore, Md.; Norfolk, Va., and Havana, Cuba.

W. C. DeArmond has taken over the business of the Protectus Company, Philadelphia, Pa., having become owner by purchase of the company from the receivers. The manufacture of the same high grade paints for the protection of metal and wood, marine compositions and insulating paints will be continued under the trade name of the Protectus Paint Co. The new company will also furnish a full line of enamels, japans, dryers and reducing oils.

The Isthmian Canal Commission will receive bids until March 7 for hoisting engine, capstans and engine, pumps, boring machine, steel castings, dipper bails, gear cutters, milling tools, slitting saws, stocks and dies, twist drills, bits, chisels, open links, tacks, chain blocks, gages, oil cups, steam whistles, unions, bellows, rubber belting, wick packing, gage glasses, rakes, steel tapes, water-closets, filing cabinets, chair bottoms, coal tar, etc. (Circular No. 561.)

A feeling of confidence as to the prospective business for 1910 in electric motors, generators and transformers was manifested by the district and branch office managers of the Crocker-Wheeler Co., Ampere, N. J., during their convention held last week in the main office and works of the company at Ampere, N. J., and in New York. As this company preserved its personnel and organization during the season of dull business, it now considers itself in better condition than before to manufacture and market its line of a.c. and d.c. motors, generators and transformers.

At the annual stockholders' meeting of the King-Lawson Car Company, Middletown, Pa., on February 9, the following directors were elected for the ensuing year: Thomas Lawson, G. O. Draper, Edward Bailey, Harold C. Hansen, Paul A. Kunkel, Arthur King and Howard W. Bible. At the directors' meeting, called immediately after the adjournment of the stockholders' meeting, the following officers were chosen for 1910: Thomas Lawson, president and general manager; Howard W. Bible, vice-president; Harold C. Hansen, treasurer, and Paul A. Kunkel, secretary.

The annual conference of managers and agents of the Ingersoll-Rand Co., New York, was held on February 1-5, inclusive. The executive officers of the company and the heads of departments from the home office in New York were present, while the general sales force was represented by managers and agents from all of the domestic and several of the foreign offices. The company's plants at Easton, Pa.; Phillipsburg, N. J.; Painted Post, N. Y., and Athens, Pa., were visited by the entire attendance during the first three days, and the last two days were given over to business meetings held at the Hotel Astor, New York. About 50 representatives of the company were present during the several meetings. Foreign representatives were present from London, Paris, Milan, Mexico City and Montreal.

Lucian C. Brown, second vice-president of the Ralston Steel Car Co., Columbus, Ohio, has resigned. Mr. Brown has been identified with the company since its organization in 1905. His plans for the future are indefinite. Mr. Brown is a graduate of the Ohio State University. After leaving college he entered the employ of the Morgan Engineering Co., at Alliance, Ohio, as an apprentice in the shops, and worked his way through the several departments, and was night superintendent at the time he left to go with the Ralston Steel Car Co. at Columbus. During the last few years he has been identified with the committee work of the Railway Supply Manufacturers' Association in connection with the M. M. and M. C. B. annual conventions, and is now chairman of the transportation committee of that association.

At a meeting of the board of directors of the Pullman Company, Chicago, held February 10, it was decided to call a special stockholders' meeting for March 21, at which would be submitted a proposition for capitalizing the surplus assets of the company to the extent of $20,000,000. The considerations influencing this action were said to be that the increased investment in the manufacturing facilities of the company had been so material and considerable as to justify the directors in the belief that it should be represented in additional capital stock. There were certain reserve accounts in the manufacturing department, hitherto held in abeyance to meet possible contingencies, but which present conditions render improbable. These items, together with the existing surplus as shown in the published statement of the last fiscal year, and the current results of operation, are regarded by the board as a justification for making this recommendation.

The annual report of the Chicago Pneumatic Tool Co. for the year ended December 31, 1909, shows total profits of $558,928. This compares with total profits of $289,625 for 1908. Last year there was written off for depreciation, including repairs and renewals to buildings and plants and developing and perfecting new tools, $140,168, comparing with $92,000 written off for depreciation, repairs and renewals in the previous year. After the payment of interest on bonds and sinking fund instalments there was a balance of $250,610 carried to surplus in 1909, as against $21,500 in 1908. Of the total profits in 1909 but $186,468 was earned in the first half year, leaving $372,460 profits earned in the second half year. The balance sheet of December 31 shows cash in hand amounting to $118,296, and accounts and bills receivable, less reserves, amounting to $1,909,032. Accounts and vouchers payable amounted to $106,981 and bills payable to $60,000. The president's report, dated February 11, says that at the present time virtually all of the plants are being operated to their full capacity.

The American Car & Foundry Co., New York, is offering for sale a number of freight locomotives and wooden gondola cars. Both the locomotives and cars have been thoroughly overhauled. The locomotives are class 2-8-0 and the principal dimensions are as follows:

Weight on drivers	154,500 lbs.
Total weight	174,500 "
Cylinders	19½ in. x 28 in.
Diameter of drivers	57 in.
Working steam pressure	200 lbs.
Heating surface, tubes	2,210 sq. ft.
" " firebox	156 "
" " total	2,366 "
Tubes, number	302
" outside diameter	2 in.
" length	14 ft.
Firebox, length	95 in.
" width	67 in.
Grate area	44 sq. ft.
Water capacity	5,000 gals.

The locomotives were built to burn soft coal. The American Car & Foundry Co. will repaint and reletter the locomotives as desired. The gondola cars are of 80,000 lbs. capacity and measure 37 ft. 4 in. long, 8 ft. 2 in. wide and 3 ft. 8 in. high over all; 36 ft. 6 in. long and 9 ft. wide inside. The flooring is 1¾-in. thick. The cars have the following special equipment:

Bolsters	Am. Steel Fdries' cast steel, body and truck
Brake-beams	Chicago Railway Equipment Co.
Couplers	Monarch
Draft gear	Miner type D 209-210
Dust guards	Symington
Journal boxes	Symington
Wheels	33-in., 650 lbs., cast iron

The cars, like the locomotives, will be repainted and relettered to suit the purchaser, and they will be guaranteed to pass M. C. B. interchange. Detailed specifications and prices may be had by addressing the American Car & Foundry Co. at New York, Chicago or St. Louis.

Changes in the Organization of the McGraw Publishing Company.

James M. Wakeman, for the past 11 years vice-president of the McGraw Publishing Company, resigned this office at the recent annual meeting of the company. While not in serious ill health Mr. Wakeman feels it desirable to be relieved from business cares in order to recover his former physical condition, and his future plans include a visit of a year or more to Europe for a complete rest. After a successful connection of some years with the *American Machinist* and *Locomotive Engineering*, Mr. Wakeman joined the McGraw Publishing Company at its formation in 1899 and was one of its incorporators. As the chief assistant in the management of the company he has been a strong factor in the success which it has achieved and has guided its business career along the broadest lines and with rare ability. The departure of Mr. Wakeman will be a source of the keenest regret to his associates, and without doubt also to the host of friends he has made in the electric railway field. Mr. Wakeman will not retire immediately but will continue for several months as a director of the company and in active work.

Hugh M. Wilson will occupy the office of vice-president of the McGraw Publishing Company made vacant by the resignation of Mr. J. M. Wakeman. The greater part of his active business of 23 years since graduation from college has been passed in technical journalism and as publisher of the *Railway Age* and the *Electric Railway Review* he gained an enviable reputation as an enterprising, successful and constructive manager of newspaper properties. He sold his interest in these publications early in 1908 and later became vice-president of the Barney & Smith Car Company, Dayton, Ohio, an office which he has just resigned to take up his present work. A biographical sketch of Mr. Wilson was published July 9, 1909, page 64.

TRADE PUBLICATIONS.

Brake-Beams.—The Buffalo Brake-Beam Co., New York, has just issued a new catalogue containing a large number of halftone and line illustrations of its brake-beams.

Great Northern.—The Great Northern has issued a 24-page booklet on the "Fertile Flathead Valley, Montana." The advantages of this region for fruit raising are fully described by photographs and descriptive matter.

Chicago & North Western.—The Chicago, Union Pacific and Northwestern line has issued a folder describing the through train service from Chicago to Colorado, Utah, California and the Pacific coast, also one giving through passenger train schedules from Chicago.

Alternating Currents in Railway Signaling.—The paper on this subject by W. K. Howe, chief engineer of the General Railway Signal Co., which was read at the meeting of the Railway Signal Association in New York City last June, and which was printed in the *Railroad Age Gazette* of July 9 and 16, has been reprinted by the Signal Company in *Bulletin No. 16.*

RAILWAY STRUCTURES.

ARGENTINE, KAN.—The Atchison, Topeka & Santa Fe is building a new brick roundhouse at a cost of $40,000. The building will contain 27 stalls designed to receive the largest engines in use. Thirteen of the stalls are to be done in a few weeks and the completed building will be ready for use about June 1.

BEECH GROVE, IND.—The Cleveland, Cincinnati, Chicago & St. Louis has completed plans for the new car shops mentioned in the *Railway Age Gazette* of February 11. The plans call for 12 buildings, including coach shop, paint shop, planing mill, separate repair shops for wood and steel freight cars, a foundry, an addition to the power house, an oil house and a concrete reservoir with a capacity of 350,000 gallons. The construction is to be of brick and steel with slate roofs.

BIRMINGHAM, ALA.—Plans have been started for the erection of extensive shops at Boyles, on the outskirts of Birmingham, Ala., by the Louisville & Nashville. They will consist of nine separate buildings, including a power house, to be built on a 120-acre tract and will cost $655,000. The plant should be finished by early fall.

BLAIR, NEB.—The Chicago & North Western is building a new passenger station at a cost of $30,000. The building is of brick with slate roof, 28 ft. wide and 175 ft. long, and has two waiting rooms, ticket office, baggage, express and toilet rooms. It is to be ready for occupancy about April 1.

CINCINNATI, OHIO.—See Cincinnati, Hamilton & Dayton under Railway Construction.

FORT WILLIAM, ONT.—The Canadian Pacific bridge, to be built over the Kaministiqua river, is to be a lift structure with double deck. The estimated cost is $750,000. It is expected to have the work finished by October 15. A bridge to be built over the McKeller river is also to be a lift structure, and is to cost about $300,000.

GLIDDEN, TEX.—The Southern Pacific has let the contract to a contracting firm in Houston, Tex., for a 24-stall roundhouse. The building is to be of concrete and brick and the cost is estimated at $32,000. An 80-ft. turntable will be installed.

HASTINGS, N. Y.—See New York Central & Hudson River under Railway Construction.

MADISON, WIS.—The Chicago & North Western will start work May 1 on a new passenger station at Madison, to cost $200,000. The building will be built on the site of the present station, and is expected to be finished by December. A temporary station is to be used while the new building is being put up.

MONTREAL, QUE.—See Ottawa, Montreal & Eastern under Railway Construction.

MEXICO CITY, MEX.—Fire in the yards of the National Railways of Mexico on February 9 destroyed property valued at $150,000, according to press estimates, including a gas plant and a number of loaded box cars.

NEW YORK.—See New York Central & Hudson River under Railway Construction.

OUTLOOK, SASK.—See Canadian Pacific under Railway Construction.

PORTLAND, ORE.—The Oregon Railroad & Navigation Co. has petitioned the city to close certain streets to allow the building of a freight house and terminal yards in the east part of the city.

REGINA, SASK.—See Canadian Pacific under Railway Construction.

RENO, NEV.—In addition to the office building mentioned in the *Railway Age Gazette* of November 26, the Nevada-California-Oregon has let the contract to local contractors for a roundhouse and carpenter shop.

ST. PAUL, IND.—The Cleveland, Cincinnati, Chicago & St. Louis advises that it plans to renew the superstructure of the bridge over Flat Rock creek. The new work will consist of four deck plate girder spans.

SOUTH BARTONVILLE, ILL.—The Peoria Terminal Railway is to let the contract soon for building new car shops to replace those destroyed by fire last fall. The estimated cost is $30,000.

TERRE HAUTE, IND.—The Southern Indiana, according to press reports, will build a new roundhouse at an estimated cost of $100,000.

TOLEDO, OHIO.—The Cincinnati, Hamilton & Dayton has let the contract to the Great Lakes Dredge & Dock Co., Chicago, for the new ore docks mentioned in the *Railway Age Gazette* of February 4. The Wellman-Seaver-Morgan Co., Cleveland, Ohio, will build the ore handling machinery. (See Cincinnati, Hamilton & Dayton under Railway Construction.)

TORONTO, ONT.—According to press reports work will be started about May 1 abolishing grade crossings between Bathurst street and the Humber. It is expected to have the work finished within two years at a cost of $2,000,000. The Grand Trunk, it is said, will elevate four of its tracks. The city is to pay one-third of the cost of elevating two tracks.

Late News.

The items in this column were received after the classified departments were closed.

Henry Graves, Jr., has been elected a director of the Central of New Jersey, succeeding H. McK. Twombly, deceased.

Preliminary surveys are to be made at once for an extension of the Caro Northern from Mount Enterprise, Tex., northeast to Pinehill, about 15 miles.

Contracts are said to be in for building a 10-mile cut-off on the Norfolk & Western around Petersburg, Va. The improvements are to be made to eliminate the heavy grades on the present line.

Basil Magor has resigned from the firm of Wonham, Magor & Sanger, New York, to become president of the Wonham-Magor Car & Manufacturing Co. The name of the first mentioned firm will be changed to Wonham, Sanger & Bates.

Announcement is said to be made that the Canadian Northern will build between 500 and 600 miles of line in the western part of Canada, including the British Columbia line during 1910. It is expected that work will be started soon on the line north of Lake Superior.

Directors of the Minneapolis, St. Paul & Sault Ste. Marie have declared a semi-annual dividend of 3½ per cent. on the common stock, placing the stock on a 7 per cent. per annum basis. The regular semi-annual dividend of 3½ per cent. was declared on the preferred stock, payable April 15. In 1908 and 1909 6 per cent. was paid on the common stock.

President Taft, in a letter dated February 16 to the secretary of the treasury, says that through an oversight of Congress the appropriation of $100,000 for the collection of the corporation net income tax cannot be used for indexing and putting on public record the returns made by corporations, and that therefore the publicity provision of the corporation tax will have to be abandoned until Congress makes a specific appropriation for this work.

The New York Connecting Railroad has filed with the Public Service Commission the necessary property consents required for its franchise. The New York Connecting is controlled jointly by the Pennsylvania Railroad and the New York, New Haven & Hartford, and plans to build a road from a connection with the Long Island Railroad across the East river at Randall's and Ward's islands, thence over little Hell Gate to the Bronx, where connections will be made with the New York, New Haven & Hartford.

W. G. McAdoo, president of the Hudson & Manhattan, in commenting on the sale of $11,000,000 notes of the Hudson Companies, says that the tunnel to Twenty-third street and Sixth avenue, New York, is being rapidly extended to Thirty-third street and will be completed early in the fall. The line to Jersey City is being extended and will shortly reach the business section of the city. On the completion of the system there will be $64,500,000 Hudson & Manhattan bonds outstanding, but for two years the Hudson Companies agree to have interest paid on $5,000,000 of these bonds only if net earnings of the Hudson & Manhattan company are sufficient to pay this interest.

The profits of the Pressed Steel Car Co. for the year ended December 31, 1909, including the sales of the Canada Car Co. stock, amounted to $1,954,583, as compared with $265,478 in 1908. There was written off for depreciation and renewals $120,000 last year and $110,000 the year before, leaving in 1909 a balance of $1,834,583, which, after subtracting $875,000 in dividends on the preferred, left a surplus for the year of $959,583, which equals 7.67 per cent. earned on the $12,500,000 common stock. After payment of dividends on the preferred in 1908 there was a deficit of $719,522. The 1909 balance sheet shows accounts receivable amounting to $2,157,671; inventory, $2,842,075, and cash, $987,360. These figures compared with the 1908 balance sheet as follows: Accounts receivable, $668,105; inventory, $246,509, and cash, $2,837,990. Accounts and bills payable totaled $1,639,361 on December 31, 1909, and $169,532 on December 31, 1908.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Virginian Railway is in the market for eight Mallet, 11 Mikado and one switching locomotive.

The Washington, Idaho & Montana advises that one Prairie and one consolidation locomotive have been ordered from the American Locomotive Co.

The Baltimore & Ohio, reported in the *Railway Age Gazette* of February 4 as asking prices on a number of locomotives, will order 30 Mallets, of 420,000 lbs. weight each, and 120 consolidation locomotives of 227,000 lbs. weight each.

The Great Northern has ordered 40 ten-wheel and 25 Mallet locomotives from the Baldwin Locomotive Works. They will be equipped with superheaters and the Mallets will also have feed water heaters. The ten-wheelers will be divided in two types of 20 each, as shown by the following general dimensions:

	Mallet.	20 10-wheel.	20 10-wheel.
Weight on drivers.....	350,000 lbs.	155,000 lbs.	134,000 lbs.
T'l weight (inc. tank).	518,200 lbs.	358,200 lbs.	292,000 lbs.
Cylinders	23 & 35 x 32 in.	26 in. x 30 in.	22 in. x 28 in.
Diameter of drivers....	55 in.	73 in.	73 in.
Boiler, type	Belpaire.	Belpaire.	Belpaire.
Working stm. press..	200 lbs.	150 lbs.	150 lbs.
Heating surf., tubes...	3,683 sq. ft.	3,153 sq. ft.	2,400 sq. ft.
" " firebox..	225 "	201 "	195 "
" " total...	5,651 "	3,354 "	2,595 "
Tubes, number	382	314	244
" outside diam....	2¼ & 5½ in.	2 & 5½ in.	2 & 5½ in.
" length	15 ft. 8 in.	17 ft.	16 ft. 6 in.
Firebox, type.....	Belpaire.	Belpaire.	Belpaire.
" length	117 in.	120 in.	120 in.
" width	96 in.	66¼ in.	40¼ in
Grate area	78 sq. ft.	55 sq. ft.	33.5 sq. ft.
Water capacity	8,000 gals.	8,000 gals.	8,000 gals.
Coal capacity, ...	13 tons.	13 tons.	13 tons.

The Chicago, Rock Island & Pacific, as reported in the *Railway Age Gazette* of February 11, has ordered 25 Pacific and 50 consolidation locomotives from the American Locomotive Co. Delivery is specified for May and June, 1910.

General Dimensions.

	Pacific.	Consolidation.
Weight on drivers	148,000 lbs.	180,000 lbs.
Total weight	227,000 "	201,000 "
Cylinders	23 in. x 28 in.	23 in. x 30 in.
Diameter of drivers.....	73 in.	63 in.
Boiler, type.	Wagon top.	Wagon top.
" working stm press.	185 lbs.	185 lbs.
Heating surface, tubes...	3,375 sq. ft.	2,427 sq. ft.
" " firebox..	180 "	168 "
" " total ..	3,555 "	2,595 "
Tubes, number	328	340
" outside diameter ..	2 in.	2 in.
" length	19 ft. 9 in.	15 ft. 6 in.
Firebox, length	109 in.	120 in.
" width	61 in.	60 in.
" material	Steel.	Steel.
Grate area	45 sq. ft.	50 sq. ft.
Water capacity	7,500 gals.	7,000 gals.
Coal capacity	13 tons.	15 tons.

These locomotives will be equipped with electric headlights and Walschaert valve gear. The Pacifics will have the Gold steam heat equipment and superheaters.

CAR BUILDING.

The Michigan United Railways are in the market for 20 city cars.

The Arkansas, Oklahoma & Western is in the market for 12 twelve-yd. air dump cars.

The Cleveland, Cincinnati, Chicago & St. Louis is building at its Brightwood, Ind., shops 25 standard caboose cars.

The Nova Scotia Steel & Coal Co., New Glasgow, N. S., has ordered 25 thirty-ton hopper bottom gondola cars from the Pennsylvania Equipment Co.

The Grand Rapids Electric Railway Co., Grand Rapids, Mich., has ordered 12 electric city cars from the American Car Co. This item was incorrectly reported in the late news of last week.

The Southern Pacific, previously mentioned as being in the market for electric cars, is understood now to be ready to close a contract for about 100 cars, including motor, trailer and express cars.

The Missouri & North Arkansas has ordered 20 thirty-ton furniture cars from the American Car & Foundry Co., as reported in the *Railway Age Gazette* of February 4. These cars will weigh 45,000 lbs. and will have wood bodies and composite underframes. They will be 50 ft. 9⅝ in. long and 9 ft. 7⅝ in. wide, over all, and 49 ft. 10⅛ in. long, 9 ft. wide and 9 ft. high, inside measurements.

The Denver, Laramie & Northwestern, previously mentioned in the *Railway Age Gazette* as being in the market for freight equipment, has ordered 50 forty-ton steel underframe box and 30 thirty-ton steel underframe stock cars from the American Car & Foundry Co. These box cars were referred to in the late news column last week. The same company has ordered 20 fifty-ton Hart convertible ballast cars and 40 National dump cars from the Rodger Ballast Car Co.

The Boston & Maine, reported in the *Railway Age Gazette* of February 11 as being in the market for 100 passenger cars, has ordered this equipment from the Laconia Car Co. These cars will be of non-vestibule type, 60 ft. 2 in. long and 9 ft. wide, inside measurements, and 68 ft. 3 in. long, 10 ft. 2¼ in. wide and 14 ft. 4 in. high, over all. The bodies will be of wood and underframes composite. The special equipment includes:

Bolsters, body	Cast steel
Bolsters, truck	Cast steel
Brakes	Westinghouse, 1412 high-speed
Brake-beams	Diamond special
Brake-shoes	Diamond "S" flanged
Brasses	5 in. x 9 in., M. C. B.
Buffing device	Forsyth
Centering device	Chaffee
Couplers	Tower
Curtain material	Pantasote
Draft gear	Miner
Dust guards	Wood M. C B.
Heating system	Vapor system
Journal boxes	Malleable iron
Lighting system	Pintsch
Paint	B. & M. standard
Platforms	Comb. bolster and platform; Commonwealth
Roofs	B. & M. standard
Seat covering	Plush
Side bearings	B. & M. standard
Springs	B. & M. standard
Trucks	Cast steel; Commonwealth Steel Co.
Ventilators	Automatic
Wheels	No. 5 Midvale
Window fixtures	B. & M. standard

MACHINERY AND TOOLS.

See Toledo, Ohio, under Railway Structures.

See Isthmian Canal Commission under Supply Trade News.

The Arkansas, Oklahoma & Western, Rodgers, Ark., is in the market for some drilling machines.

The Baltimore & Ohio is reported to have ordered a number of the tools for which it was reported in the market in the *Railway Age Gazette* of January 28.

The Mt. Vernon Car Manufacturing Co., Mt. Vernon, Ill., has ordered from the Standard Bridge Tool Co., Pittsburgh, Pa., one Thomas automatic spacing table.

IRON AND STEEL.

The Southern is reported in the market for 45,000 to 60,000 tons of rails.

The Public Service Ry., Newark, N. J., has ordered 1,800 tons of girder rails from the Pennsylvania Steel Co.

The Lake Superior & Ishpeming has ordered from the Lackawanna Steel Co. 200 tons of structural steel for a viaduct in Ishpeming, Mich.

The Wabash-Pittsburgh Terminal Ry. has ordered from the McClintic-Marshall Construction Co. 400 tons of structural steel for the viaduct mentioned in the *Railway Age Gazette* of February 4.

General Conditions in Steel.—A slight improvement in the steel business is reported for this week and orders will probably reach considerable proportions within the next six weeks if the present conditions prevail. The recent purchase, by the U. S. Steel Corporation, of 25,000 tons of Bessemer pig iron from the Bessemer Pig Iron Association is generally thought to indicate that the Corporation anticipates activity for its mills into the summer months. The recent purchases of and inquiries for rails and equipment by the railway companies is a very favorable feature in the steel industry.

SIGNALING.

The following are some of the details of the interlocking and block signal work to be installed on the North Western's Chicago terminal by the General Railway Signal Co. There will be five interlocking towers aggregating about 550 levers, of which 225 will control signals and 292 switches, derails and movable frogs. The signal company's model 4 movement will be used on switches and the model 2 movement on derails. All interlocking signals will give indications in the upper right-hand quadrant and will be three-position dwarfs of the model 2-A type. All signals will be lighted by electric lamps. Detector bars will be used throughout, in addition to electric detector and route locking. The electric locking will contain many novel features especially designed for this installation. All wires will be contained in lead-covered cable. There will be electric lights above the levers in the machines to show the approach or recession of a train separately, and illuminated diagrams will also be provided to show the condition of the track. All apparatus will be operated from storage battery and a separate rotary converter will be provided at each block signal bridge for charging. There will be 55 disk automatic block signals of the Hall type between Noble street and Clinton street, and between Division street and Clinton street. It is intended to make the whole equipment the best and most complete that it is possible for signal engineering to devise.

Colored Roofing Patent Decision.

It is now unlawful to use any colored, except by painting, "flexible weatherproof prepared roofings" other than that made by the Standard Paint Company, New York. This is the sum of the decision, January 24, 1910, by Judge Ray, of the U. S. Circuit Court. The decision, about 10,000 words, is such a minute examination of the history of materials and processes that it is near to being a treatise on the art of roofmaking. The two patents on colored ruberoid, dated November 22, 1904, cover both the product and the processes by which it is made. Both of these general claims are upheld with an enthusiasm born of exhaustive study:

"The process pointed out in the patent which varies from the prior art was successful. The prior art was not. All the constitutent elements of a product, a new article of manufacture, may be old, as of course these were, but this product as a complete article of manufacture was new, and it was better than any that had gone before. I think the evidence establishes that the first successful colored roofing upon the market was this colored ruberoid made in accordance with the claims of the patents in suit. They are popular and have an extensive and increasing sale. They are pleasing and attractive in appearance to those who desire a colored roof and who use a roofing of this character. It is shown that these roofings are durable and serviceable, and that the coloring is permanent."

T. A. Griffin on Radical Railway Regulation.

A pamphlet entitled "Radical Railroad Regulation," by T. A. Griffin, president of the Griffin Wheel Company, Chicago, is being given very wide circulation. Mr. Griffin points out that the threat of further radical railway regulation is making itself evident by retarding the return of prosperity. There is hesitation felt by the greater part of the business community, and Mr. Griffin explains this as follows:

"The one great and most apparent element which has caused this hesitation is that the railway corporations of this country have stopped the purchase of anything beyond their immediate necessities, so much so that betterments which had been projected (which are not only betterments, but in a great many cases are almost, or soon will be, necessities) amounting to over $500,000,000, have been held up. It is customary for railways to prepare their budgets of expenditures January 1. If these budgets had been prepared on the lines of necessities the outlook for general business, particularly among manufacturers, would be exceptionally good for 1910. These budgets

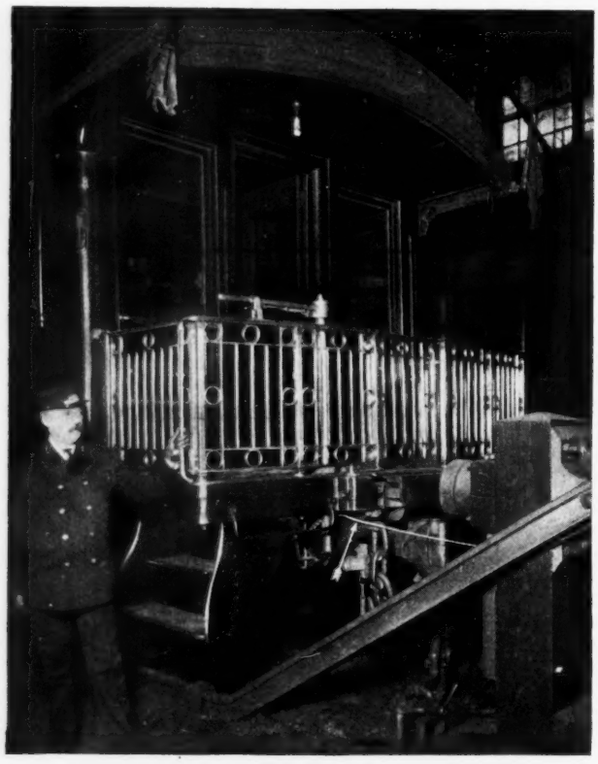
have not been presented, and are not within the call, or even within the sight, of those who would gladly welcome them, and it is doubtful when we will be able to make any reasonable forecast in the manufacturing and commercial world. It is unquestionably true that the railways would gladly enter into a year of liberal expenditure, but as matters stand now, it is quite possible that they will be compelled to drop back into the condition they were in the latter part of 1907 and during the year 1908, that is, purchase nothing except that which is absolutely essential, and the reasons are exactly the same as those that existed in the early part of 1907, that is, 'Radical Railroad Regulation.'"

The remedy for this situation, Mr. Griffin says, is not merely to prevent further radical railway regulation but to stop the agitation for it, and he suggests that business men should tell their representatives in Congress and the state legislatures that a halt must be called on radical railway regulation.

Telephone Equipment on the Twentieth Century Limited.

In the lounging cars on the Twentieth Century Limited, telephones are installed for the use of passengers who, on arriving at their destinations, desire to make business or other engagements before leaving the train. The telephone is arranged for connection to a jack box at each station where the length of stop warrants, thus connecting the train to the local exchange. The standard Bell grade telephone apparatus, made by the Western Electric Co., New York, is used.

The manner in which the connection is made at the Albany station on the route of the Twentieth Century Limited is



Manner of Making Telephone Connection.

shown in the illustration. The observation cars are wired for telephone service, and the connection is made through the private railway branch exchange switchboard. The circuit from a jack in this switchboard is run to the bumper post at the end of the track and thence into a protection box. The jack has a spring shutter, which automatically closes when the connection is withdrawn, thus protecting the contacts from dust and moisture while the train is in motion. From this jack the wiring, enclosed in piping, passes through the car to a point directly under a desk in the observation end of the car.

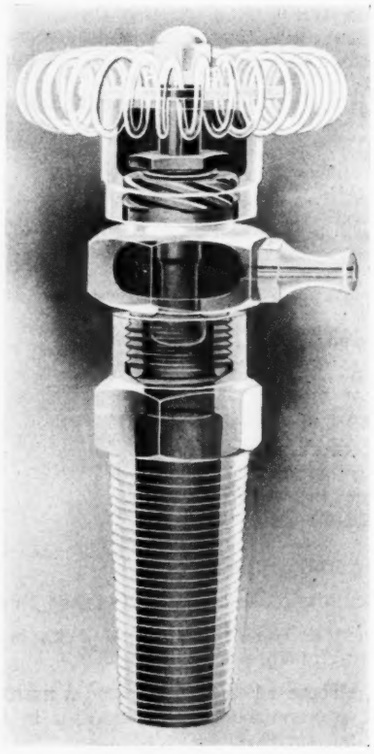
The telephone is in charge of the porter and is stored in a closet when not in use. When the train enters a station the telephone connection is made and remains connected until within one minute of leaving time.

The Boston & Albany allows its patrons free local use of the telephone at Albany. The New York Central & Hudson River has similar arrangements for use at New York and Chicago.

Gaco Automatic Locomotive Gage Cock.

The locomotive gage cock shown herewith is one for which the following advantages are claimed: simple in operation, quick in action, self-controlling, non-leaking, and designed so as to be free from incrustation.

The tendency of enginemen to neglect the sufficiently frequent use of gage cocks may be said to have occasioned the one of the design here shown. The chief feature of it is that the valve opens against the pressure rather than with it, as is the case in the compression cock. In using, it is but necessary to give the hand wheel a quick turn. The closing is automatic and saves the 20 or 30 seconds of time usually consumed by the engineman, who is required to close a gage cock after he is satisfied as to the water height. This feature is also a unique and satisfactory one in keeping the valve seat clean, thus prolonging the length of its life. Excessive wear of the seat, due to too tight closing, is prevented, as the valve is seated by the boiler pressure only. As the seating is accomplished with, rather than against, the boiler pressure, less force is necessary to close the valve. Each successive seating of a hand-operated valve, operating against the pressure, may have to be at least slightly tighter than the preceding one. This continued tightening against the seat tends to distort and destroy it.



Gaco Automatic Locomotive Gage Cock.

It is also possible to regrind the valve without removing it. In case of leakage, it is quite possible that this is due to scale or sediment lodging on the seat of the valve. This can be removed and the seat reground by simply revolving the stem.

This gage is also designed with the particular object of protecting the boiler tappings and making repairs easier and less expensive. The gage cock is made in two parts, a threaded shank and separate body. The shank is screwed into the boiler, and the body, which contains the valve, the seat and all the working parts, is screwed into this shank. These bodies are made interchangeable, and each has a common seating position, so that when screwed into a shank the nozzle will be in its correct position. All of the other parts are also made interchangeable to provide for replacement in case of accident.

The handle is made of high-grade steel wire nickle plated to prevent rust. This wire construction in a handle is particularly advantageous as it affords an easier and more secure grip.

These gage cocks are made by the Pittsburgh Gage & Supply Co., Pittsburgh, Pa., and are also handled by Willis C. Squire, dealer in railway supplies and specialties, Western Union building, Chicago.